

Appendix D2:

Affected Environment Report

Long Bridge Project

Environmental Impact Statement (EIS)

Affected Environment Report

September 2019

Long Bridge Project EIS

Affected Environment Report

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List of Acronyms

µg/m ³	Micrograms per meter cubed
AADT	Average Annual Daily Traffic
AAII	All Appropriate Inquiries
ACS	American Community Survey
ACZO	Arlington County Zoning Ordinance
ADA	Americans with Disabilities Act
AHERA	Asbestos Hazard Emergency Response Action
AIRFA	American Indian Religious Freedom Act
AMR	American Medical Response
ANSI	American National Standards Institute
APE	Area of Potential Effect
AQI	Air Quality Index
ART	Arlington Transit
ASTM	American Society for Testing and Materials
AVE	Area of Visual Effect
BGEPA	Bald and Golden Eagle Protection Act
BRAC	Base Realignment and Closure
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAJO	Captain John Smith Chesapeake National Historic Trail
CCTV	Closed-circuit television
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (also known as Superfund)
CERCLIS	Comprehensive Emergency Response, Compensation, and Liability Information System

CESQG	RCRA Conditionally Exempt Small Quantity Generator
CFA	Commission on Fine Arts
CFR	Code of Federal Regulations
CH ₄	Methane
CLRP	MWCOG Financially Constrained Long-Range Transportation Plan
CO	Carbon monoxide
CO ₂	Carbon dioxide
CORRACTS	RCRA Corrective Actions
CSXT	CSX Transportation
CVSZ	Central Virginia Seismic Zone
CWA	Clean Water Act
CWR	Continuous Welded Rail
CZMA	Coastal Zone Management Act
dBA	Decibel (noise)
dBV	Decibel (vibration)
DC SHPO	District of Columbia Historic Preservation Office
DC	District of Columbia
DCFD	District of Columbia Fire Department
DCGIS	District of Columbia Geographic Information Systems
DCMR	District of Columbia Municipal Regulations
DCR	Department of Conservation and Recreation
DCRA	District of Columbia Department of Consumer and Regulatory Affairs
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDOT	District Department of Transportation
DDT	Dichlorodiphenyltrichloroethane

DEIS	Draft Environmental Impact Statement
DFIRM	Digital Flood Insurance Rate Map
DHCD	Department of Housing and Community Development
DHS	Department of Homeland Security
DNH	Virginia Department of Conservation and Recreation Division of Natural Heritage
DOD	U.S. Department of Defense
DOE	Determination of Eligibility
DOEE	District Department of Energy and Environment
DPS	Distinct Population Segment
DRPT	Virginia Department of Rail and Public Transportation
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
EMS	Emergency Medical Services
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ERNS	Emergency Release Notification System
ESA	Endangered Species Act of 1973
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FDR	Franklin Delano Roosevelt
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act

FINDS	Facility Index System
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Studies
FLPMA	Federal Land Policy and Management Act
FR	Federal Register
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FWIS	Fish and Wildlife Information Service
GHG	Greenhouse gas
GIS	Geographic Information System
GSA	General Services Administration
GWMP	George Washington Memorial Parkway
HAPC	Habitat Area of Particular Concern
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCS	Hazardous Communication Standard
HHS	U.S. Department of Health and Human Services
HMIRS	Hazardous Materials Information Reporting System
HSEMA	District of Columbia Homeland Security and Emergency Management Agency
HUC	Hydrologic Unit Code
HUD	U.S. Department of Housing and Urban Development
Hz	Hertz
IPA	Initial Project Assessment
IPaC	USFWS Information, Planning, and Consultation System
IPCC	Intergovernmental Panel on Climate Change
IRIS	Integrated Risk Information System
L1UBH	Limnetic Unconsolidated Bottom Permanently Flooded-Nontidal

LBJMG	Lyndon Baines Johnson Memorial Grove
Ldn	Day-night Average Level
LE	L'Enfant
Leq	Energy-average Level
Lmax	Maximum A-weighted Level
LOD	Limits of Disturbance
LQG	RCRA Large Quantity Generator
LUST	Leaking underground storage tank
LWCF	U.S. Land and Water Conservation Fund
MBTA	Migratory Bird Treaty Act
MD DNR	Maryland Department of Natural Resources
MD	Maryland
MMPA	Marine Mammal Protection Act
MPD	Metropolitan Police Department
mph	Miles per hour
MPO	Metropolitan Planning Organization
MS4	Municipal Separate Storm Sewer System
MSATs	Mobile Source Air Toxics
MSW	Municipal Solid Waste
MWAA	Metropolitan Washington Airports Authority
MWCOG	Metropolitan Washington Council of Governments
N2O	Nitrous oxide
N4	George Mason Memorial
N8	Mandarin Oriental Hotel
NAAQS	National Ambient Air Quality Standards
NAMA	National Mall and Memorial Parks

NATA	National Air Toxics Assessment
NCA	National Climate Assessment
NCPC	National Capital Planning Commission
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NFRAP	No Further Remedial Action Planned
NHDE	Natural Heritage Data Explorer
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NMFS	NOAA National Marine Fisheries Service
NO ₂	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NonGen	RCRA No Longer Generating
NO _x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS DO-12	National Park Service Director's Order 12
NPS	National Park Service
NPSOA	National Park Service Organic Act
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NS	Norfolk Southern
NV1	Long Bridge Park
NV3	Jefferson Memorial

NV6	National Park Service Parking Lot and Department of Defense Facility
NWI	National Wetlands Inventory
O3	Ozone
OHM	Oil and hazardous materials
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic aromatic hydrocarbon
Pb	Lead
PCBs	Polychlorinated biphenyls
PEM	Palustrine Emergent Wetland
PEM2R	Palustrine, non-persistent emergent system
PFO	Palustrine Forested
PFO1R	Palustrine forested broad-leaved deciduous, seasonally flooded tidal
PGA	Peak Ground Acceleration
PIH	Poisonous by inhalation
PM10	Particulate matter sized 10 micrometers or less
PM2.5	Particulate matter sized 2.5 micrometers or less
ppb	Parts per billion
ppm	Parts per million
PRTC	Potomac and Rappahannock Transportation Commission
PSS	Palustrine scrub-shrub wetland
PSS1R	Palustrine scrub-shrub, broad-leaved deciduous, seasonally flooded tidal
Qal	Recent Alluvium
Qp	Patapsco and Recent Alluvium
R1	Riverine Tidal
R1UBV	Riverine Tidal Unconsolidated Bottom Permanent-Tidal
RCRA	Resource Conservation and Recovery Act

RF&P	Richmond, Fredericksburg, and Potomac Line
RPA	Resource Protection Area
RTE	Rare, Threatened, and Endangered
SARA	Superfund Amendments and Reauthorization Act
SAV	Submerged Aquatic Vegetation
SDWA	Safe Drinking Water Act
SEL	Sound Exposure Level
SEMS	Superfund Enterprise Management System
SFHA	Special Flood Hazard Area
SHPO	State Historic Preservation Officer
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SLOSH	Sea Lake Overland Surges from Hurricanes
SO ₂	Sulfur dioxide
SO _x	Sulfur oxides
SPCC	Spill Prevention, Control, and Countermeasure
TCP	Traditional Cultural Property
The Project	The Long Bridge Project
TIH	Toxic by Inhalation
TMDL	Total Maximum Daily Load
TMDLs	Total Maximum Daily Loads
TRI	Toxic Release Inventory
TSA	Transportation Security Administration
TSCA	Toxic Substances Control Act
TSD	Treated, Stored, and Disposed of Hazardous Waste
TSDF	RCRA Treatment, Storage, and Disposal Facility

TSS	Total Suspended Solids
U.S.	United States
UCR	National Uniform Crime Reporting
UCR	Uniform Crime Reporting
URAA	Uniform Relocation Assistance and Real Property Acquisition Policies Act
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCG	U.S. Coast Guard
USCP	U.S. Capitol Police
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USPP	U.S. Park Police
UST	Underground storage tank
V-CRIS	Virginia Cultural Resource Information System
VA	Virginia
VCP	District of Columbia Voluntary Cleanup Program
VCZMP	Virginia Coastal Zone Management Program
VDAC	Virginia Department of Agriculture and Consumer Services
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation
VIM	Virginia Institute of Marine Science

VLR	Virginia Landmark Register
VOC	Volatile Organic Compounds
VPDES	Virginia Pollutant Discharge Elimination System
VRE	Virginia Railway Express
VRP	Voluntary Remediation Program
VSMP	Virginia Stormwater Management Program
WAP	Wildlife Action Plan
WC1	Watercourse 1
WC2	Watercourse 2
WC3	Watercourse 3
WL1	Wetland 1
WL2	Wetland 2
WL3	Wetland 3
WMATA	Washington Metropolitan Area Transit Authority
WQS	Water Quality Standards
WSR	Wild and Scenic Rivers
WUS	Washington Union Station

1.0 Overview

1.1. Introduction

The Federal Railroad Administration (FRA), jointly with the District Department of Transportation (DDOT), is preparing an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act of 1969 (NEPA) for the Long Bridge Project (the Project).¹ The Project consists of potential improvements to the Long Bridge and related railroad infrastructure located between RO Interlocking near Long Bridge Park in Arlington, Virginia, and L'Enfant (LE) Interlocking near 10th Street SW in Washington, DC (collectively, the Long Bridge Corridor).² The Long Bridge Project connects logical termini; has independent utility even if no additional transportation improvements in the area are made; and does not restrict consideration of alternatives for other reasonably foreseeable transportation improvements in the area.

1.2. Purpose of This Report

This report describes the existing conditions (affected environment) associated with the Project. This report describes the environment in which the Project would be constructed and operated. Characteristics of the surrounding area are given to familiarize the EIS reader with the geography, land use, demographics and economics, and the physical and natural environment. The Council on Environmental Quality (CEQ) regulations for implementing NEPA require that an EIS:

“[S]hall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration. The descriptions shall be no longer than is necessary to understand the effects of the alternatives. Data and analyses in a statement shall be commensurate with the importance of the impact, with less important material summarized, consolidated, or simply referenced.”³

The level of information provided in this report for each resource provides the full results of the technical analysis of the affected environment, to allow DDOT, FRA, and Cooperating Agencies to review the methodology and results of the analysis.⁴ As appropriate and as required by the CEQ regulations, this information may be condensed or summarized in the Draft EIS (DEIS) Affected Environment chapter, proportionate to that resource's potential to be affected by the Project.

The following resource categories are included:

¹ 42 USC 4321

² Note that “RO” is the proper name of this interlocking. It is not an acronym.

³ 40 CFR 1500

⁴ *Cooperating Agency* means any Federal agency other than a lead agency that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment. The selection and responsibilities of a cooperating agency are described in 40 CFR 1501.6 and 23 USC 139. A State or local agency of similar qualifications or, when the effects are on a reservation, an Indian Tribe may by agreement with the lead agency become a cooperating agency.

- Natural Ecological Systems and Endangered Species
- Water Resources and Water Quality
- Geologic Resources
- Solid Waste Disposal and Hazardous Materials
- Transportation and Navigation
- Air Quality and Greenhouse Gas Emissions
- Energy Resources
- Land Use and Property
- Noise and Vibration
- Aesthetics and Visual Resources
- Cultural Resources
- Parks and Recreation
- Social and Economic
- Public Health and Elderly and Persons with Disabilities
- Safety and Security
- Environmental Justice

1.3. Purpose and Need

The purpose of the Project is to provide additional long-term railroad capacity and to improve the reliability of railroad service through the Long Bridge Corridor. Currently, there is insufficient capacity, resiliency, and redundancy to accommodate the projected demand in future railroad services. The Project is needed to address these issues and to ensure the Long Bridge Corridor continues to serve as a critical link connecting the local, regional, and national transportation network. Although not part of the Project's Purpose and Need, the Long Bridge Project will explore the potential opportunity to accommodate connections that follow the trajectory of the Long Bridge Corridor to the pedestrian and bicycle network. The feasibility of this opportunity will be assessed as the Project progresses, and will consider whether a path can be designed to be consistent with railroad operator plans and pursuant to railroad safety practices. Future efforts to accommodate connections to the pedestrian and bicycle network may be advanced as part of the Project, or as part of a separate project(s) sponsored by independent entities.

1.4. Study Area

The Project Area is the related railroad infrastructure located between the RO Interlocking in Arlington, Virginia, near Long Bridge Park and LE Interlocking in Washington, DC, near 10th Street SW, as shown in

Figure 1-1 | Long Bridge Project Area



Study Areas are larger areas that are potentially indirectly affected by the Project; boundaries will vary by environmental resource. The extent of the Study Area is a function of the characteristics of a given resource and the potential scope of impacts on the resource from the Proposed Action and its alternatives. Depending on the resource, a Local Study Area and a larger Regional Study Area may be defined.

The baseline year used to establish the Affected Environment is 2017. This year was chosen because the EIS was initiated in 2016 and the majority of existing conditions data was collected in 2017. The baseline conditions presented in this chapter reflect 2017 Existing Conditions or the most recent year for which data are available.

2.0 Natural Ecological Systems and Endangered Species

2.1. Overview

This section describes the Study Area's natural and ecological systems (terrestrial and aquatic biological resources, and habitats), including ecologically sensitive areas. Ecologically sensitive areas refer to natural areas that the state or Federal government has designated for conservation purposes. At the Federal level, ecologically sensitive areas include designated National Wildlife Refuges and "critical habitat" areas. At the state level, ecologically sensitive areas include those designated by the Virginia Department of Conservation and Recreation (VDCR) and the District's Department of Energy and Environment (DOEE) as Natural Area Preserves and Natural Community Areas.

For the purposes of this analysis, natural ecological systems within the Study Area include terrestrial vegetation, wetland vegetation, submerged aquatic vegetation, terrestrial wildlife, and aquatic biota (for example, benthic macroinvertebrates and fish). Other natural ecological systems such as wetlands and water resources are described in **Section 3.0, Water Resources and Water Quality**. The portion of the Potomac River crossed by the Study Area is not a designated Wild and Scenic River (WSR) and is not listed on the National Rivers Inventory.

This section also describes the methodology for evaluating the presence of Federally and state-listed rare, threatened, and endangered (RTE) species and associated critical habitats in the Study Area. The Endangered Species Act of 1973 (ESA) defines an endangered species as "any species which is in danger of extinction throughout all or a significant portion of its range." The ESA also defines a threatened species as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

2.2. Regulatory Context and Guidance

The following laws, regulations, agency jurisdictions, and guidance are pertinent to natural ecological systems and endangered species resources. Key regulations and guidance that are most relevant to the Project are listed below.

2.2.1. Natural Ecological Systems and Endangered Species Federal Laws, Regulations, and Other Guidance

Multiple Federal agencies play a role in the regulation of ecological systems, including the U.S. Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (EPA), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Fish and Wildlife Service (USFWS). Each agency plays a role in the permitting, monitoring, restoring, and mapping of natural ecological systems nationwide.

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- U.S. Fish and Wildlife Coordination Act of 1965⁵
- Anadromous Fish Conservation Act of 1965⁶
- EO 13508, Chesapeake Bay Protection and Restoration Section 203 Final Coordinated Implementation Strategy⁷
- Clean Water Act of 1972 (CWA)⁸
- Coastal Zone Management Act 1972 (CZMA)⁹
- Magnuson-Stevens Fishery Conservation and Management Act of 1976¹⁰
- Migratory Bird Treaty Act of 1918 (MBTA)¹¹
- National Wildlife Refuge System Administration Act of 1966¹²
- Section 4(f) of the U.S. Department of Transportation Act of 1966¹³
- Wild and Scenic Rivers Act of 1994¹⁴
- Wilderness Act of 1964¹⁵
- Rivers and Harbors Act of 1899¹⁶
- Endangered Species Act (ESA) of 1973¹⁷
- Bald and Golden Eagle Protection Act (BGEPA) of 1940¹⁸
- Marine Mammal Protection Act (MMPA) of 1994¹⁹

⁵ 16 USC 661

⁶ 16 USC 757a-757g; 79 Stat 1125

⁷ 75 FR 26226

⁸ 33 USC 1251

⁹ 16 USC 1451

¹⁰ 16 USC 1801

¹¹ 16 USC 703-712; 50 CFR 10.13

¹² 16 USC 668

¹³ 23 CFR 774

¹⁴ 16 USC 1271

¹⁵ 16 USC 1131

¹⁶ 33 USC 403; 33 CFR 322

¹⁷ 16 USC 1531

¹⁸ 16 USC 668-668d

¹⁹ Public Law 103-238

- EO 13112 of February 3, 1999: Invasive Species²⁰
- EO 11990 of May 24, 1977: Protection of Wetlands²¹

The USFWS is the Federal agency responsible for administration of the ESA, the BGEPA, and the MBTA. The primary Federal legislation regulating threatened and endangered species, however, is the ESA. The NOAA National Marine Fisheries Service (NMFS) is the regulatory agency with oversight of the ESA for marine mammals and fishes.

Relevant Federal Guidance:

- USFWS handbook for Section 7 consultation—Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act²²
- Incorporating Biodiversity Considerations into Environmental Impact Analysis Under NEPA (CEQ, 1993)²³

2.2.2. Natural Ecological Systems and Endangered Species State and Local Laws, Regulations, and Other Guidance

States are given the responsibility of serving as ‘Chief Stewards’ for wildlife within their borders (per USFWS). With guidance from the ESA, states may suggest species for listing, monitor species, assess habitats, and designate critical habitat regarding any RTE or candidate species. In Virginia, responsibilities are shared among multiple agencies. The Virginia Department of Agriculture and Consumer Services (VDAC) is the regulatory authority for the conservation and preservation of RTE plant and insect species within Virginia. The Virginia Department of Game and Inland Fisheries (VDGIF) has legal authority for preservation of vertebrate and other invertebrate RTE species. Finally, VDCR’s Division of Natural Heritage (DNH) is responsible for the identification, protection, and stewardship of Virginia’s RTE plant and animal species habitat. The District acts in the role of a state government as well as a local government. Therefore, the District agency responsible for enforcing local wildlife laws is the DOEE.

²⁰ EO 13112

²¹ EO 11990

²² U.S. Fish and Wildlife Coordination Act and National Marine Fisheries Service. 1998. Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act. Accessed from https://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf. Accessed January 10, 2018.

²³ CEQ. 1993. Incorporating Biodiversity Considerations into Environmental Impact Analysis Under NEPA. Accessed from https://ceq.doe.gov/publications/incorporating_biodiversity.html. Accessed May 3, 2018.

Relevant State and Local Laws and Regulations:

- Virginia Natural Area Preserves Act²⁴
- District of Columbia Urban Forest Preservation Act of 2002²⁵
- District of Columbia Municipal Regulations (DCMR) Chapter 10-A6 (Environmental Protection)²⁶
- DCMR Chapter 19-15 (Fish and Wildlife)²⁷
- DCMR Chapter 21-14 (Submerged Aquatic Vegetation)²⁸
- Municipal Code of Arlington County includes ordinances that pertain to ecological resources under two primary headings: Chesapeake Bay Preservation Ordinance (Chapter 61)²⁹, and Trees and Shrubs (Chapter 67; Urban Forest Act)³⁰

With guidance set by the ESA, states can propose species for listing, monitor species, and designate critical habitat regarding any threatened, endangered, or candidate species.

- Virginia Endangered Plant and Insect Species Act.³¹ The VDAC is the regulatory authority for the conservation and preservation of threatened and endangered plant and insect species.
- Endangered Species provisions under the Virginia Wildlife and Fish Laws.³² The VDGIF has legal authority for preservation of vertebrate and other invertebrate endangered and threatened species.
- DNH is responsible for the identification, protection, and stewardship of Virginia's RTE plant and animal species habitat.
- The District does not have a specific ordinance addressing listed RTE species, nor does Arlington County have a specific provision for rare species protection within its municipal code.

Relevant State and Local Guidance:

- There are no relevant state and local guidance for natural ecological systems and endangered species. The District addresses listed species indirectly through its adoption of the 2015 Wildlife Action Plan (WAP),³³ which is overseen by the DOEE

²⁴ Code of Virginia 10.1-1010

²⁵ 50 DC Reg 888

²⁶ DCMR 10-A6

²⁷ DCMR 19-15

²⁸ DCMR 21-14

²⁹ Arlington County Code Chapter 61

³⁰ Arlington County Code Chapter 67

³¹ Code of Virginia 3.2-1000

³² Code of Virginia 29.1-563

³³ District Department of Energy and Environment (DOEE). 2015. District of Columbia Wildlife Action Plan. Accessed from <https://doee.dc.gov/service/2015-district-columbia-wildlife-action-plan>. Accessed April 29, 2018.

2.3. Study Area

The Local Study Area definitions for natural ecological systems and RTE species vary depending on the resource. For some resources, such as vegetation, the Study Area includes the immediate Project footprint and lands and waters within 500 feet of the Project Area. For the portion of the Project over the Potomac River, the Study Area for RTE species extends approximately 2,000 feet upstream and downstream to address the potential for scour and deposition to affect habitat for RTE species. Data are also collected adjacent to the Study Area from waters connected to resources within the Project footprint, as well as resources that may be affected, directly or indirectly, by the Project, especially when data sources within the Study Area are limited. The Study Area is shown in **Figure 2-1**.

The analysis of existing conditions focused on resources where the presence or absence of any RTE species or their habitats, biological communities, and unique natural habitats within the designated Study Area could be determined. This Study Area was designated to capture all relevant impacts to natural ecological systems and RTE species, and a wider Regional Study Area was not necessary for this topic. For the purposes of this document, only data collected since 2007 were considered current enough to represent existing conditions in the Study Area.

2.4. Methodology

Available reports, data, GIS databases, and USFWS maps were reviewed to:

- Determine locations within the Study Area of habitat suitable for listed species, specifically with respect to life cycle, reproductive phenology, and other relevant habitat provisions. This analysis considered known population loci and demography within the vicinity of the Study Area.
- Verify the presence or absence of RTE species and their suitable habitat.

2.5. Affected Environment

This section describes the Study Area's affected environment for natural and ecological systems (such as terrestrial and aquatic biological resources and habitats); Federal and state RTE plants and animals; and ecologically sensitive areas.

2.5.1. Natural Ecological Systems

This section describes the Study Area's urban and natural terrestrial vegetation; dominant wetland vegetation; historic extent of submerged aquatic vegetation (SAV); terrestrial wildlife (for example, birds, mammals, and herpetofauna); aquatic fauna such as benthic macroinvertebrates and fish; and wildlife and waterfowl preserves, refuges, or parkland with the primary purpose of protecting wildlife habitat.

Figure 2-1 | Natural Ecological Systems and Rare, Threatened, and Endangered (RTE) Species Study Area



Terrestrial Vegetation

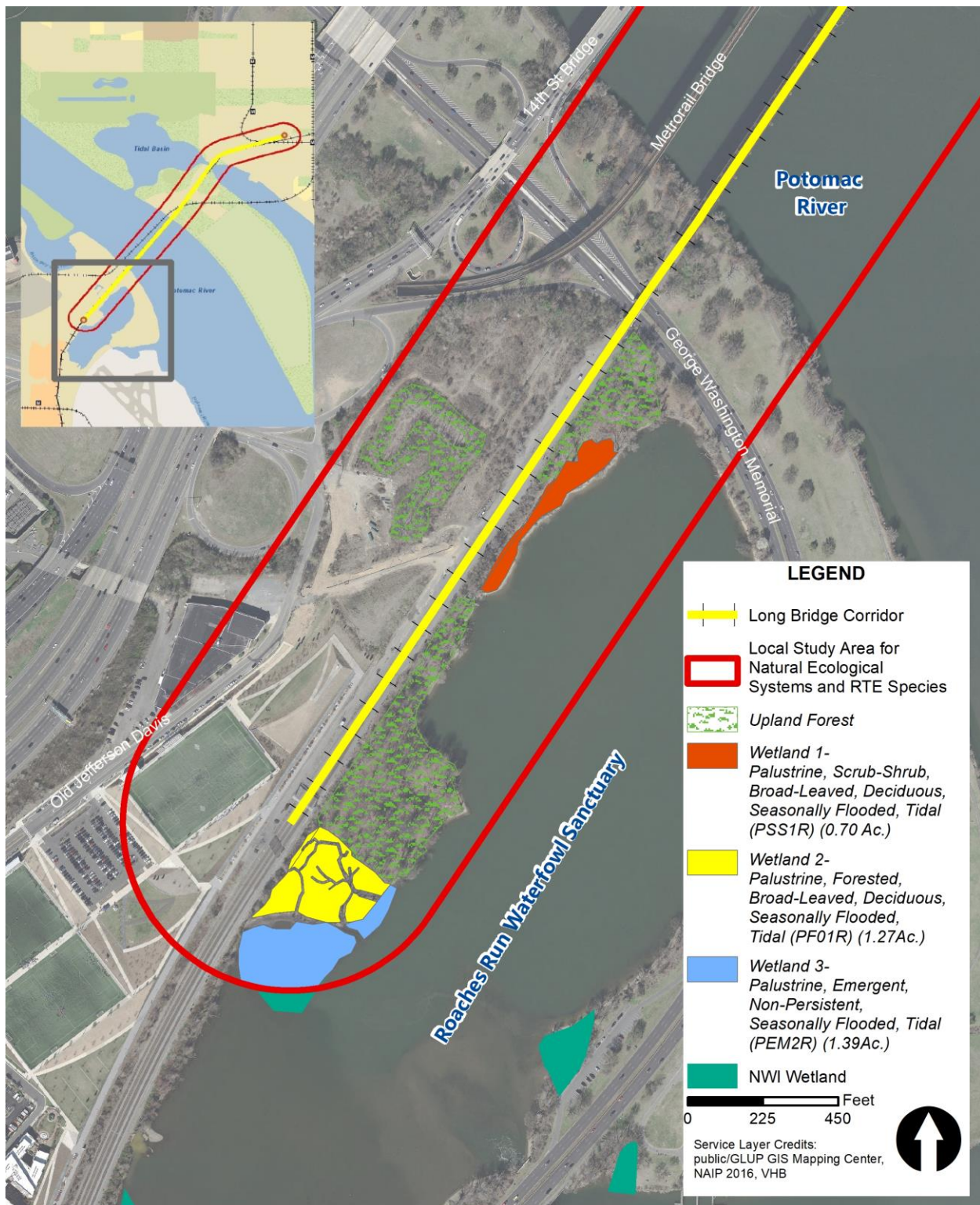
An assessment of the vegetative communities along terrestrial portions of the Study Area was conducted using a combination of direct field observations and aerial photography. The Study Area is located within a highly urbanized landscape that also contains parkland and natural areas, including the Potomac River. The entire Study Area's terrestrial habitat is considered developed, and includes public and government lands interconnected by transportation uses, maintained grasses and landscaping, and small areas of early-succession habitats. Existing vegetation within the Study Area is limited in extent and diversity due to the urban nature of the landscape; however, small areas of early-succession, disturbed forest exist in the southern portion of the Study Area, adjacent to proposed construction and the CSX Transportation (CSXT) railroad corridor (**Figure 2-2**).

Two small deciduous forest areas are in the southern portion of the Study Area, east of the CSXT railroad corridor. One area is located south of Wetland 1 and contains a mixture of willow oak (*Quercus phellos*), black cherry (*Prunus serotina*), sassafras (*Sassafras albidum*), red maple (*Acer rubrum*), and American sycamore (*Platanus occidentalis*) in the canopy, and smooth sumac (*Rhus glabra*), staghorn sumac (*Rhus typhina*), American holly (*Ilex opaca*), and Japanese honeysuckle (*Lonicera japonica*) in the understory. The forest located north of Wetland 1 is dominated by ash-leaf maple (*Acer negundo*), black cherry, Japanese pagoda tree (*Styphnolobium japonicum*), and southern bald-cypress (*Taxodium distichum*). The understory is comprised of American pokeweed (*Phytolacca americana*), Amur honeysuckle (*Lonicera maackii*), English ivy (*Hedera helix*), garlic-mustard (*Alliaria petiolata*), Japanese honeysuckle, and pawpaw (*Asimina triloba*).

Another area of early-succession forest is located west of the CSXT railroad corridor and encompasses two small excavated basins. The larger and northernmost of the forested patches is comprised of eastern cottonwood (*Populus deltoides*), black willow (*Salix nigra*), American sycamore, white mulberry (*Morus alba*), and black locust (*Robinia pseudoacacia*). The understory includes Amur honeysuckle, white mulberry, and groundsel (*Baccharis halimifolia*). The dominant herbaceous vegetation includes common reed (*Phragmites australis*), dock-leaf smartweed (*Persicaria lapathifolia*), Amur peppervine (*Ampelopsis glandulosa*), and Canada goldenrod (*Solidago canadensis*). The smaller of the forested patches includes the same tree and shrub species, but lacks an herbaceous layer. This area is designated for redevelopment during the next phase of the Long Bridge Park expansion.

North of these excavated basins, the landscape consists of upland scrub-shrub vegetation with scattered trees, indicative of old field transitioning towards an early-succession forest. Shrub and sapling species include Amur honeysuckle, smooth sumac, eastern cottonwood, tree-of-heaven (*Ailanthus altissima*), American elm (*Ulmus americana*), Virginia pine (*Pinus virginiana*), Bradford pear (*Pyrus calleryana*), Japanese honeysuckle, princess tree (*Paulownia tomentosa*), and black raspberry (*Rubus occidentalis*). Herbaceous vegetation included broom-sedge (*Andropogon virginicus*), yellow Indian grass (*Sorghastrum nutans*), and bush-clover (*Lespedeza* sp.). This area is also designated for redevelopment in the Long Bridge Park expansion.

Figure 2-2 | Terrestrial and Wetland Vegetation



In addition to these natural communities, narrow strips of maintained grass with scattered landscape trees are present on both sides of the Potomac River. Landscape trees located on the western side of the river include American sycamore, swamp white oak (*Quercus bicolor*), willow oak, and river birch (*Betula nigra*). On the eastern side of the river, observed landscape trees include Japanese zelkova (*Zelkova serrata*), red maple, willow oak, weeping willow (*Salix babylonica*), loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), Northern red oak (*Quercus rubra*), American elm, white mulberry, Japanese pagoda tree, and pin oak (*Quercus palustris*).

Wetland Vegetation

Wetlands are jointly defined by the EPA and USACE as “those areas that are inundated or saturated by surface 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. Wetlands generally include swamps, marshes, bogs, and similar areas.”³⁴ Wetland vegetation characteristics are described below.

Due to its highly urbanized landscape, the Study Area mostly lacks vegetated wetlands, with the exception of three tidal wetlands in the southern portion of the Study Area associated with Roaches Run Waterfowl Sanctuary. These systems are designated as Wetland 1, Wetland 2, and Wetland 3 (**Figure 2-2**). Wetland 1 (approximately 0.70 acres) is classified as palustrine scrub-shrub, broad-leaved deciduous, seasonally flooded tidal (PSS1R). The dominant species consist of silver maple (*Acer saccharinum*), silky dogwood (*Cornus amomum*), brookside alder (*Alnus serrulata*), sweet Autumn virgin’s-bower (*Clematis ternifolia*), and Japanese honeysuckle (*Lonicera japonica*). Wetland 2 (approximately 1.27 acres) is classified as palustrine-forested broad-leaved deciduous, seasonally flooded tidal (PFO1R), with dominant species consisting of green ash (*Fraxinus pennsylvanica*), common buttonbush (*Cephalanthus occidentalis*), silky dogwood, narrow-leaf cat-tail (*Typha angustifolia*), crimson-eyed rose-mallow (*Hibiscus moscheutos*), rice cut grass (*Leersia oryzoides*), and eastern poison ivy (*Toxicodendron radicans*). Wetland 3 is a freshwater marsh bisected by the southern Study Area boundary. Approximately 1.39 acres of this wetland occur within the Study Area. The National Wetlands Inventory (NWI) classifies the wetland as an emergent system with persistent vegetation. Vegetation was not observable during the wintertime field studies, although summertime aerial images confirm the presence of wetland vegetation. This evidence leads to a conclusion that the wetland contains non-persistent vegetation likely dominated by one or more species of arrow arum (*Peltandra virginica*), arrowhead (*Sagittaria lancifolia* and *S. latifolia*), and pickerelweed (*Pontederia cordata*).

Submerged Aquatic Vegetation

SAV is defined as vascular plants that grow completely underwater or up to the water surface in tidal and non-tidal waterways. Although flowers may protrude above the water surface, the rest of the plant is completely submerged. In the Chesapeake Bay region, most SAV grows between March and

³⁴ 33 CFR 329

October,³⁵ with peak biomass in the summer and fall, depending on species.³⁶ SAV is considered ecologically important to the Chesapeake Bay region, as it provides habitat and food for wildlife, absorbs wave energy and nutrients, produces oxygen, improves water clarity, and stabilizes bottom sediments.³⁷

The Virginia Institute of Marine Science (VIMS), in coordination with NOAA, Virginia Department of Environmental Quality (VDEQ), Maryland Department of Natural Resources (MD DNR), and the Virginia Coastal Zone Management Program (VCZMP), documents the presence of SAV within the Chesapeake Bay Watershed on a yearly basis (mid-1990s to present). This documentation is conducted using aerial photography to identify SAV bed locations, size, and density; species are identified during site visits. These data are analyzed to determine changes in density, develop trends, and implement preservation strategies.

Historically, SAV was abundant in the Potomac River within the District. The DOEE Fisheries Management Branch reported an improvement of SAV cover density and species diversity in 2013 within District waters compared to 2011.³⁸ In 2015, the Fisheries Management Branch reported a threefold increase in SAV cover density, compared to 2013; however, a slight decline in species diversity was reported.³⁹ This cover density is the highest since 2002.

SAV has also been documented within the Study Area, although a detailed field delineation of the extent of SAV was not performed as part of this study. Rather, data were gathered from DOEE and the VIMS to identify documented locations of SAV in the Study Area. For the purposes of this analysis, only SAV data collected since 2013 were considered current enough to represent existing conditions in the Study Area. Historical mapping (2013–2017) was reviewed to determine the extent of SAV beds within the Potomac River. Based on this review, SAV was determined to have been present over this time period in the

³⁵ The Scientific and Technical Advisory Committee (STAC). 2007. Submerged Aquatic Vegetation (SAV) Reproductive Ecology in the Chesapeake Bay: Evaluating the State of the Knowledge and Assessing Future Research Needs. STAC Publication 07-006. Report of the STAC Workshop, March 6–7, 2007, Annapolis, Maryland.

³⁶ Moore, K.A., D.J. Wilcox, and R.J. Orth. 1998. Biomass of Submerged Aquatic Vegetation in the Chesapeake Bay. Final Report. CB993267-02. Virginia Institute of Marine Science.

³⁷ Batiuk, R., P. Bergstrom, M. Kemp, E. Koch, L. Murray, C. Stevenson, R. Bartleson, V. Carter, N. Rybicki, J. Landwehr, C. Gallegos, L. Karrh, M. Naylor, D. Wilcox, K. Moore, S. Ailstock, and M. Teichberg. 2000. Chesapeake Bay submerged aquatic vegetation water quality and habitat-based requirements and restoration targets: A second technical synthesis. CBP/TRS 245/00. EPA/903/R-00/014. Annapolis, MD: U.S. Environmental Protection Agency, Chesapeake Bay Program. Accessed from <http://archive.chesapeakebay.net/pubs/sav/index.html>. Accessed December 12, 2017.

³⁸ DOEE. 2014. The District of Columbia Water Quality Assessment: 2014 Integrated Report to the US Environmental Protection Agency and Congress Pursuant to Sections 305(b) and 303(d) Clean Water Act. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/Integrated%20Report%20to%20EPA%20and%20US%20Congress%20regarding%20DC%E2%80%99s%20Water%20Quality%20%E2%80%93%202014_0.pdf. Accessed May 3, 2018.

³⁹ DOEE. 2016. District of Columbia Water Quality Assessment: 2016 Integrated Report to the US Environmental Protection Agency and Congress Pursuant to Sections 305(b) and 303(d) Clean Water Act. Accessed from <https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/2016%20Final%20IR.pdf>. Accessed May 3, 2018.

Potomac River and in Roaches Run (**Figure 2-3**).⁴⁰ Most recent available data (2017) obtained from VIMS show that SAV beds are present in Roaches Run within the southern portion of the Local Study Area and along the north shoreline of the Potomac River immediately upstream from the Long Bridge. In addition, VIMS shows that two SAV beds are present in the Potomac River directly adjacent to, but outside of, the Study Area. One of these SAV beds is located along the Virginia (western) bank of the Potomac River downstream of the Study Area. The second SAV bed is located along the District (eastern) bank of the Potomac River upstream of the Study Area.

Wildlife

A detailed assessment of expected and observed wildlife was conducted within the Study Area, including direct field observations and database searches for potentially affected terrestrial and semi-aquatic vertebrate species. Aquatic vertebrates, such as fish, are discussed in the **Aquatic Biota** section, below. The majority of the Study Area is comprised of open water or urban landscapes devoid of vegetation or containing primarily managed lawn and planted ornamental trees and shrubs. Wildlife use of the developed landscapes is relatively limited based on a lack of necessary food, water, cover, and shelter. Smaller portions of the Study Area contain early successional forest or scrub shrub habitat with sufficient area to support species of wildlife adapted to disturbed or edge habitats.

Birds are the most widely represented wildlife species within the Study Area, as many species are aquatic or semi-aquatic and make use of the Potomac River, Washington Channel, Tidal Basin, and Roaches Run. Other bird species are adapted to disturbed or edge habitats present within the Study Area. While there may be limited numbers of breeding birds within the Study Area, other species may use habitats within the Study Area during the winter or as temporary stopover habitat during spring and fall migration. Observed bird data were obtained through the Cornell Laboratory of Ornithology eBird website.⁴¹ eBird is an online checklist database of bird sightings submitted by volunteers. The user-uploaded bird sightings provide presence absence information, as well as abundance data from specific localities that can be accessed by the public. For this Project, data covered a 10-year period from January 2007 through December 2017. Within the Study Area, sites for which eBird data were obtained include Roaches Run Waterfowl Sanctuary, Long Bridge Park, and the National Mall. The Roaches Run Waterfowl Sanctuary is located on the southern end of the Study Area in Arlington County, Virginia, as shown in **Figure 2-3**. This sanctuary represents an oasis within the mostly developed urban land use within the greater Washington, DC, area. As such, wildlife, especially wintering waterfowl, use the aquatic habitats provided by the Roaches Run Waterfowl Sanctuary. No eagle nests are known to occur within 600 feet of the Project Area. During summer, osprey (*Pandion haliaetus*), green heron (*Butorides virescens*), red-winged blackbird (*Agelaius phoeniceus*), and mallard (*Anas platyrhynchos*) are common.

⁴⁰ Orth, R.J., D.J. Wilcox, J.R. Whiting, A.K. Kenne, L. Nagey, and E. R. Smith. 2015. 2015 Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay and Coastal Bays. VIMS Special Scientific Report Number 155. Final report to EPA, Chesapeake Bay Program, Annapolis, MD. Grant No. CB96321901-0. Accessed from <http://www.vims.edu/bio/sav>. Accessed June 4, 2018. Also Orth, R.J., D.J. Wilcox, J.R. Whiting, A.K. Kenne, L. Nagey, and E. R. Smith, 2014; Orth, R.J., D.J. Wilcox, J.R. Whiting, L. Nagey, A. Owens, and A. Kenne, 2013; Orth, R.J., D.J. Wilcox, J.R. Whiting, L. Nagey, A.K. Kenne, and E. R. Smith, 2012; D.J. Wilcox, J.R. Whiting, L. Nagey, A.K. Kenne, and E. R. Smith, 2011.

⁴¹ Sullivan, B.L., C.L. Wood, M.J. Iliff, R.E. Bonney, D. Fink, and S. Kelling. 2009. eBird: a citizen-based bird observation network in the biological sciences. *Biological Conservation*. 142(10): 2282-2292.

Long Bridge itself may also serve as nesting habitat for birds, though the most likely species include non-native European starling (*Sturnus vulgaris*) and feral rock pigeon (*Columba livia*).

Figure 2-3 | Locations of Submerged Aquatic Vegetation from 2012–2015



Use of available habitats within the Study Area by mammals, reptiles, and amphibians was not as easily documented through available sources as for birds; however, the VDGIF maintains an online inventory of known or likely to occur wildlife species by county. This online resource was used to generate a list of known or likely to occur species within a fixed search radius of 3 miles from the Study Area. This list was further modified based on the availability of suitable habitat within the Study Area for each of the species documented in the VDGIF report. The common and scientific names of the mammals were taken from the VDGIF report, while those for reptiles and amphibians was taken from Crother.⁴²

Terrestrial and aquatic mammals, amphibians, and reptiles within the Study Area are mostly represented by common species that are tolerant of some disturbance. These would include species such as white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), gray squirrel (*Sciurus carolinensis*), American beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), painted turtle (*Chrysemys picta*), snapping turtle (*Chelydra serpentina*), green frog (*Lithobates clamitans*), and American bullfrog (*Lithobates catesbeianus*). The shoreline of the Potomac River on the Virginia side likely serves as a wildlife corridor, particularly where the Mount Vernon Trail extends through the Study Area.

Aquatic Biota

The Potomac River is a direct tributary to the Chesapeake Bay, is tidally influenced within the Study Area, and supports an important aquatic ecosystem. Existing data on aquatic biota within the Study Area were gathered from DOEE^{43, 44} and Versar, Inc.⁴¹ These organizations conduct periodic monitoring of benthic macroinvertebrates and fish as part of long-term water quality monitoring efforts. The presence, abundance, and diversity of aquatic biota are used by resource agencies to assess overall water quality conditions.

Benthic macroinvertebrates are small aquatic animals and aquatic insect larvae that lack backbones. The composition of the benthic macroinvertebrate community is commonly used as a gauge to determine the health of an aquatic system. Very little existing data on the benthic macroinvertebrate community within the Local Study Area are available. However, a study of aquatic snails from National Park sites in Northern Virginia documented several species in the Potomac River and in Roaches Run. Although none of the species are listed as rare, threatened, or endangered, *Gyraulus deflectus* was collected from Roaches Run, which is the first record for Arlington County. Other extant populations are known only from Accomack County.⁴⁵ The nearest monitoring site is in the Potomac River, approximately

⁴² Crother, B. 2017. Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, with Comments Regarding Confidence in Our Understanding. Eighth Edition. SSAR. Herpetological Circular No. 43:1-102.

⁴³ Interstate Commission on the Potomac River Basin (ICPRB). 2017. "Chessie BIBI" Stream Health Indicator Database. Accessed from <https://www.potomacriver.org/focus-areas/aquatic-life/chessie-bibi-stream-health-indicator/>. Accessed December 1, 2017.

⁴⁴ Adriance, C., S. Doyle, L. Lyon, S. Spencer, J. Swann, and E. C. Thadey. 2017. Biological Survey of the Anadromous and Resident Fish of the Potomac and Anacostia Rivers within the District of Columbia. District Department of Environment, Fisheries Research Branch.

⁴⁵ Steury, Brent. *Aquatic Snails (Gastropoda) from National Park Sites in Northern Virginia and Adjacent Maryland, with an Updated Checklist of Regional Species*. Banisteria. 44. 13-18.

7.4 miles downstream of the Study Area. This tidal station was sampled annually for the last 10 years and was rated as Degraded or Severely Degraded.⁴⁶

The portion of the Potomac River that lies within the Study Area is utilized by anadromous, catadromous, estuarine, and tidal freshwater fish species. The diversity and species composition of fish communities are also often indicative of the health of the aquatic system. Six DOEE fish monitoring sites are located within or near the Study Area, as shown in **Figure 2-4**. Between 2010 and 2016, the DOEE documented 44 different fish species within the Study Area, comprised of 29 genera and 14 different families, including migratory and gamefish species.

Based on DOEE sampling, American shad (*Alosa sapidissima*) and blueback herring (*Alosa aestivalis*) are the two most abundant species across all Potomac River mainstem sites within the Study Area. Other abundant species in this portion of the Potomac include gizzard shad (*Dorosoma cepedianum*), inland silverside (*Menidia beryllina*), white perch (*Morone americana*), spottail shiner (*Notropis hudsonius*), blue catfish (*Ictalurus furcatus*), eastern silvery minnow (*Hybognathus regius*), banded killifish (*Fundulus diaphanus*), and alewife (*Alosa pseudoharengus*). Five species of gamefish are found in the Potomac River mainstem: white perch, striped bass (*Morone saxatilis*), yellow perch (*Perca flavescens*), largemouth bass (*Micropterus salmoides*), and smallmouth bass (*Micropterus dolomieu*).

Blueback herring and American shad are also the most abundant fish species in the Washington Channel, with other common species including gizzard shad, white perch, spottail shiner, inland silverside, eastern silvery minnow, yellow perch, alewife, and bluegill (*Lepomis macrochirus*). In addition to the five gamefish species found in the Potomac River, walleye (*Sander vitreus*) are documented in the Washington Channel. The Washington Channel contains several fish taxa not documented by DOEE in the Potomac River mainstem within the Study Area, including redear sunfish (*Lepomis microlophus*), snakehead (*Channa* sp.), walleye, spotfin shiner (*Cyprinella spiloptera*), green sunfish (*Lepomis cyanellus*), mummichog (*Fundulus heteroclitus*), and shield darter (*Percina peltata*).

Five invasive species are documented by DOEE within the Study Area: blue catfish (*Ictalurus furcatus*), flathead catfish (*Pylodictis olivaris*), common carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), and snakehead (*Channa* sp.).

Consultation with the DOEE and NMFS confirmed that no Essential Fish Habitat (EFH) exists within the Project Area.^{47,48}

⁴⁶ Llanso, R. J., D. Zeveta, and L. C. Scott. 2015. Chesapeake Bay Water Quality Monitoring Program: Long-term Benthic Monitoring and Assessment Component Level 1 Comprehensive Report. Versar, Inc.

⁴⁷ NMFS consultation. August 15, 2018. VHB Correspondence.

⁴⁸ Department of Energy & Environment. December 6, 2018. *Section 7 Consultation*. Coastal Resources, Inc. Correspondence.

Figure 2-4 | DOEE Fish Monitoring Station Locations



2.5.2. Rare, Threatened, and Endangered (RTE) Species

Resources used to identify RTE species within the Study Area include the USFWS Information for Planning and Consultation (IPaC) system, NOAA Fisheries information, the VDGIF Fish and Wildlife Information Service (FWIS), the VDCR Natural Heritage Data Explorer (NHDE), and the District's WAP. The VDGIF FWIS identifies nine Federal or state protected RTE species likely to occur within 3 miles of the Study Area. These species include Atlantic sturgeon, northern long-eared bat, little brown bat (*Myotis lucifugus lucifugus*), tri-colored bat (*Perimyotis subflavus*), brook floater (*Alasmidonta varicosa*), wood turtle (*Glyptemys insculpta*), loggerhead shrike (*Lanius ludovicianus*), migrant loggerhead shrike (*Lanius ludovicianus migrans*), and Appalachian grizzled skipper (*Pyrgus wyandot*). The database indicates that none of these species have confirmed observations within the 3-mile radius. The database also lists the Potomac River as anadromous fish habitat. The Northern Long-Eared Bat Winter Habitat and Roost Trees application indicates no known occupied maternity roosts or hibernacula buffers present within or adjacent to the Study Area.

An initial screening using the USFWS IPaC system identified no Federally listed RTE species, critical habitats, refuge lands, fish hatcheries, and areas of seasonal importance within the Study Area, and determined that the Project would have no effect on these resources. Similarly, it was determined that the Project was unlikely to disturb nesting bald eagles and does not intersect with an eagle concentration area. Thus, additional coordination with the USFWS regarding these resources is not necessary.

On December 4, 2017, formal project review requests were sent to the USFWS, NMFS, VDCR, and DOEE to obtain information on the potential occurrence of any RTE species and ecologically sensitive communities near the Study Area. In a January 2, 2018, project review email, the NOAA Fisheries Protected Resources Division indicated that the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*) are present in the Potomac River. The New York Bight, Chesapeake Bay, South Atlantic, and Carolina distinct population segments (DPSs) of Atlantic sturgeon are Federally endangered; the Gulf of Maine DPS is Federally threatened. NOAA Fisheries indicated that individuals originating from any of these DPSs could occur in the Project Area. Shortnose sturgeon are Federally endangered throughout their range. In addition, the Potomac River has been designated as critical habitat for the Chesapeake Bay DPS of Atlantic sturgeon. Shortnose sturgeon and Atlantic sturgeon are both anadromous fish species. Neither species had been documented by DOEE in or near the Study Area from 2010 through 2016.^{49, 50}

Historically, Atlantic sturgeon were common within the Chesapeake Bay, and they are believed to have spawned within most of the major river tributaries of the Bay, including the Potomac River.⁵¹ More

⁴⁹ United States Fish and Wildlife Service (USFWS). Undated. Species Profile for Shortnose sturgeon (*Acipenser brevirostrum*). Accessed from <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6635>. Accessed December 10, 2017.

⁵⁰ USFWS. Undated. Species Profile for Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Accessed from <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=3252>. Accessed December 10, 2017.

⁵¹ National Marine Fisheries Service. 2007. Status Review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Report to the National Marine Fisheries Service (NMFS), Northeast Regional Office, Gloucester, MA. 174 pp.

recently, no captures of Atlantic sturgeon have occurred upstream of Indian Head, which is more than 20 river miles downstream from the Long Bridge Study Area.⁵²

Historically, shortnose sturgeon were also common within the Chesapeake Bay and its tributaries. Recently, few captures of shortnose sturgeon have occurred within the Potomac River. In a Potomac River shortnose sturgeon netting study initiated in 2004 by the NPS, U.S. Geological Survey (USGS), and the USFWS, one adult female shortnose sturgeon was captured and fitted with a radio transmitter in 2005 just above Indian Head, MD, off of Craney Island.⁵³ On April 10, 2006, it was tracked to Chain Bridge below Little Falls, having passed through the Study Area.⁵⁴ Other shortnose sturgeon were radio tagged and tracked during the project, but none were recorded within or near the Study Area.

Official confirmation from DOEE regarding the presence of resources in the District is pending; however, an official response from VDCR regarding the presence of natural heritage resources in Virginia was received on January 2, 2018. The VDCR letter indicates that the state-rare plants Davis's sedge (*Carex davisii*) and river bulrush (*Bolboschoenus fluvialis*) have been documented within 2 miles of the Study Area. Because these plant species are not state or Federally listed, detailed field surveys for these species were not conducted as part of this study; however, neither of these species were observed during the terrestrial or aquatic vegetation assessment fieldwork described in **Section 2.4.1**.

NPS has reported the presence of nesting sites for Peregrine Falcons (*Falco peregrinus*) and Black-Crowned Night Heron (*Nycticorax nycticorax*) on the north side of the Washington Channel along the existing railroad tracks, although no reports have been posted on eBird checklists and DOEE did not indicate their presence. While not RTE species, these species are on the District's list of Species of Greatest Conservation Need.⁵⁵ Prior to construction, the Project Sponsor would conduct a survey during nesting season to determine the species' presence.

⁵² USFWS. 2013. Unpublished data provided by M. Mangold on January 9, 2013.

⁵³ Kynard, B., M. Breece, M. Kieffer, M. Atcheson, and M. Mangold. 2006. Status of Shortnose Sturgeon in the Potomac River: Part I – Field Studies. Prepared for National Park Service. 10pp. plus maps.

⁵⁴ Breece, Matthew. August 22, 2006. Email regarding shortnose sturgeon occurrence in the Potomac River.

⁵⁵ DOEE. District of Columbia Wildlife Action Plan, 2015 Update. July 2015. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/00_2015WildLifeActionPlan_Chapters_07_31_2015_PublicVersion_0.pdf. Accessed May 20, 2019.

3.0 Water Resources and Water Quality

3.1. Overview

This section focuses on five water resource categories: water quality, wetlands and other waters of the U.S., floodplains, Chesapeake Bay Preservation Areas, and coastal zone management. This section provides an overview and key definitions for each of the water resource categories analyzed in this chapter.

3.1.1. Water Quality

In compliance with Sections 303(d), 305(b), and 314 of the Clean Water Act of 1972 (CWA) and the Safe Drinking Water Act of 1974 (SDWA), states develop a prioritized list of water bodies that currently do not meet water quality standards. In Virginia and the District, the Virginia Department of Environmental Quality (VDEQ) and District Department of Energy and Environment (DOEE) monitor streams for a variety of water quality parameters, including temperature, dissolved oxygen, pH, fecal coliform, *Escheria coli* (*E. coli*), enterococci, total phosphorus, chlorophyll-a, and benthic invertebrates, as well as metals and toxics in the water column, sediments, and fish tissues.^{56, 57}

3.1.2. Wetlands and Other Waters of the U.S.

Under the Federal definition, waters of the U.S. include all waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide; all interstate waters including interstate wetlands; other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce; all impoundments of waters defined as waters of the United States; tributary waters; the territorial sea; and wetlands adjacent to waters.⁵⁸ Wetlands are jointly defined by the U.S. Environmental Protection Agency (EPA) and U.S. Army Corps of Engineers (USACE), as “those areas that are inundated or saturated by surface 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. Wetlands generally include swamps, marshes, bogs, and similar areas.”⁵⁹ Under these definitions, the Potomac River (a traditionally navigable waterway), Washington Channel, Tidal Basin, and Roaches Run (tributary streams and impoundments), and any wetlands associated with these waterways are considered waters of the U.S.

⁵⁶ 33 USC 1251

⁵⁷ 42 USC 300f

⁵⁸ 33 CFR 329

⁵⁹ U.S. Environmental Protection Agency. Section 404 of the Clean Water Act: How Wetlands are Defined and Identified. Accessed from <https://www.epa.gov/cwa-404/section-404-clean-water-act-how-wetlands-are-defined-and-identified>. Accessed May 3, 2018.

3.1.3. Flood Hazards and Floodplain Management

The National Flood Insurance Act of 1968 and Executive Order (EO) 11988, implemented through U.S. Department of Transportation (USDOT) Order 5650.2, “Floodplain Management and Protection,” manage actions within floodplains to ensure consideration is given to the avoidance, minimization, and mitigation of adverse floodplain effects.^{60,61,62} The District, in coordination with the District Department of Consumer and Regulatory Affairs (DCRA), DOEE, and the Federal Emergency Management Agency (FEMA), is responsible for coordination of its floodplain program.

The Virginia Flood Damage Reduction Act of 1989 was enacted to improve Virginia’s flood protection programs and place related programs in one agency, the Virginia Department of Conservation and Recreation (VDCR). VDCR is manager of Virginia’s floodplain program, serves as coordinator for all flood protection programs and activities in the Commonwealth of Virginia, and is the designated coordinating agency of the National Flood Insurance Program. Under the Code of Virginia §10.1-602 (Floodplain Code), VDCR works with localities to establish and enforce floodplain management zoning.⁶³

To ensure compliance with these regulations, the DC Construction Codes 2010 provide provisions for floodplain encroachment, development, and permitting requirements.⁶⁴ District of Columbia Municipal Regulations (DCMR) have established guidelines for determining if a project would result in a floodplain encroachment, which is defined as development into a special flood hazard area (SFHA) that may impede or alter flow capacity of a floodplain. DCRA and DOEE review construction plans located within SFHAs to determine whether the following conditions are met: all proposals must minimize flood damage and conform to all applicable codes and regulations; all utilities and facilities (sewer, gas, electrical, water lines, etc.) must be located and constructed such that flood damage is minimized or eliminated; and drainage in place must be adequate enough to reduce the exposure to flood hazards.

A floodplain is defined as any land area susceptible to being inundated by floodwaters from any water source (44 CFR 59).⁶⁵ FEMA identifies the 100-year floodplain as the area with a 1 percent chance of being inundated or exceeded by a flood event in any given year, and is considered the base flood. In many areas, the base flood elevation has been calculated, which is the computed elevation that floodwater is expected to rise during the base flood. Similarly, FEMA also identifies the 500-year floodplain as the area with a 0.2 percent chance of being inundated by a flood event in any given year. The Project may affect SFHAs associated with the Potomac River including:

- AE Zones (100-year floodplain with a defined base flood elevation)

Other floodplain areas that are not considered SFHAs found within the Study Area include:

- X Zones

⁶⁰ 42 USC 4001

⁶¹ EO 11988

⁶² USDOT Order 5650.2

⁶³ Code of Virginia 10.6-602

⁶⁴ DCMR 20-31

⁶⁵ 44 CFR 59

- Areas within the 500-year floodplain
- Areas of 100-year floodplain with reduced flood risk due to levee protection
- Areas of 100-year floodplain with average depths less than 1 foot or with drainage areas less than 1 square mile
- Areas outside the 500-year floodplain

3.1.4. Chesapeake Bay Preservation Areas

As defined in the Arlington County Chesapeake Bay Preservation Ordinance (Chapter 61.5), Resource Protection Areas (RPAs) “consist of sensitive lands adjacent to water bodies with perennial flow that have intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may cause significant degradation to the quality of State waters.”⁶⁶ The purpose of an RPA is to provide a buffer between development and sensitive water resources such as streams. It has been proven a natural buffer provides water quality benefits to downstream resources, such as the Chesapeake Bay. RPAs include tidal wetlands, nontidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow, tidal shores, a buffer area not less than 100 feet adjacent to and landward of these water bodies, and such other lands considered by the Arlington County Board to meet some or all the criteria described above.

3.1.5. Coastal Zone Management

The Coastal Zone is defined in Section 304 of the Coastal Zone Management Act (CZMA) of 1972. Coastal zones are defined as coastal waters (including the lands therein and thereunder) and the adjacent shorelands, strongly influenced by each other and in proximity to the shorelines of the coastal states. Designated coastal zones include islands, transitional and intertidal areas, wetlands, salt marshes, and beaches.⁶⁷ The CZMA protects coastal areas and the surrounding habitat by defining inland coastal areas and the protection of these buffer zones within CZMA.

Virginia participates in the National Coastal Zone Management Program and has a state coastal zone management plan that includes Arlington County. However, according to the National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management, the District does not have a coastal zone management plan. Any Federal activities being conducted within the coastal zone are required to be consistent with the criteria set forth in the approved state plan or program. In order to be in compliance with the CZMA, activities that would affect the coastal zone, including development projects, must be identified by the Federal agency and reviewed for consistency with the state-specific coastal zone management plan.

⁶⁶ Arlington County Code Chapter 61

⁶⁷ 16 USC 1451

3.2. Regulatory Context and Guidance

The following laws, regulations, agency jurisdiction, and management guidance are pertinent to water resources and water quality. Key regulations and guidance that are most relevant to the Long Bridge Project are listed below.

3.2.1. Water Quality Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- Clean Water Act and Water Quality Act of 1987 Sections 401 and 402⁶⁸
- Federal Water Pollution Control Act (CWA) of 1972 as amended by the CWA (1977) and the Water Quality Act (1987)⁶⁹
- U.S. Safe Drinking Water Act (SDWA) of 1974⁷⁰
- U.S. Ground Water Rule⁷¹
- EPA National Pollutant Discharge Elimination System (NPDES) Construction General Permit⁷²
- EO 13508 of May 12, 2009: Chesapeake Bay Protection and Restoration⁷³
- Energy Independence and Security Act (EISA) of 2007, Section 438⁷⁴

Relevant Federal Guidance:

- There are no relevant Federal guidance for water quality.

3.2.2. Water Quality State and Local Laws, Regulations, and Other Guidance

Water quality is enforced at the state level, based on standards set by the DOEE, VDEQ, and EPA. States can choose to adopt national water quality standards (SDWA and CWA) or revise and adopt state specific standards.

⁶⁸ 33 USC 1251-1376

⁶⁹ 33 USC 1251-1376

⁷⁰ 42 USC 300f

⁷¹ U.S. Environmental Protection Agency (EPA). 2006. U.S. Ground Water Rule. Accessed from <https://www.epa.gov/dwreginfo/ground-water-rule>. Accessed January 12, 2018.

⁷² EPA. 2017. EPA National Pollutant Discharge Elimination System Construction General Permit. Accessed from <https://www.epa.gov/npdes/epas-2017-construction-general-permit-cgp-and-related-documents>. Accessed January 12, 2018.

⁷³ EO 13508

⁷⁴ Public Law 110-140

Relevant State, Local Laws, and Regulations:

- Virginia Stormwater Management Act⁷⁵
- Virginia Chesapeake Bay Preservation Act ⁷⁶
- Virginia Erosion and Sediment Control Law⁷⁷
- Virginia Water Quality Standards⁷⁸
- VPDES Permit Number VA 0088579, Arlington County – Authorization to Discharge under the Virginia Stormwater Management Program and the Virginia Stormwater Management Act, Effective June 26, 2013⁷⁹
- Virginia Pollution Discharge Elimination System Permit⁸⁰
- Virginia Stormwater Management Program (VSMP) Regulations⁸¹
- District of Columbia Water Pollution Control Act of 1984, as amended⁸²
- District of Columbia Water Quality Standards⁸³
- District of Columbia Storm Water Permit Compliance Amendment Act of 2000⁸⁴
- District of Columbia Municipal Regulations (DCMR), Title 21 Water and Sanitation⁸⁵

⁷⁵ Code of Virginia 62.1

⁷⁶ Code of Virginia 62.1

⁷⁷ Code of Virginia 62.1

⁷⁸ Code of Virginia 62.1

⁷⁹ Commonwealth of Virginia. 2013. Authorization to Discharge under the Virginia Stormwater Management Program and the Virginia Stormwater Management Act. Accessed from <https://arlingtonva.s3.dualstack.us-east-1.amazonaws.com/wp-content/uploads/sites/13/2013/10/MS4-Permit.pdf>. Accessed December 20, 2017.

⁸⁰ Code of Virginia 62.1-44.15 to 44.30

⁸¹ Virginia Stormwater Management Program. Accessed from <https://lis.virginia.gov/cgi-bin/legp604.exe?000+reg+9VAC25-870>. Accessed January 12, 2018.

⁸² DC Law 5-188

⁸³ DC Law 13-311

⁸⁴ DC Law 13-311

⁸⁵ DCMR 21

- NPDES Permit Number DC0000221, Government of the District of Columbia – Authorization to Discharge under the NPDES Municipal Separate Storm Sewer System Permit, Effective October 7, 2011⁸⁶⁸⁷
- DCMR 21-18 Well Construction, Maintenance, and Abandonment Standards (Well Regulations)⁸⁸
- Arlington County Code, Erosion and Sediment Control (Chapter 57)⁸⁹
- Arlington County Code, Stormwater Management Ordinance (Chapter 60)⁹⁰
- Arlington County Code, Chesapeake Bay Preservation Ordinance (Chapter 61)⁹¹

Relevant State and Local Guidance:

- VDEQ, Virginia Stormwater Management Handbook⁹²
- VDEQ, Virginia Erosion and Sediment Control Handbook⁹³
- DOEE, Stormwater Management Guidebook⁹⁴
- Arlington County Stormwater Manual: Guide to Stormwater Requirements for Land Disturbing Activities in Arlington County⁹⁵

⁸⁶ EPA. 2011. Authorization to Discharge under the NPDES Municipal Separate Storm Sewer System Permit. Accessed from https://www3.epa.gov/reg3wapd/pdf/pdf_npdes/stormwater/DCMS4/FinalPermit2011/DCMS4permit2011.pdf. Accessed December 20, 2017.

⁸⁷ District Department of Energy and the Environment (DOEE). Undated. National Pollutant Discharge Elimination System Permit Number DC0000221. Accessed from <https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/DCMS4permit2011.pdf>. Accessed January 12, 2018.

⁸⁸ DCMR 21-18

⁸⁹ Arlington County Code Chapter 57

⁹⁰ Arlington County Code Chapter 50

⁹¹ Arlington County Code, Chapter 61.

⁹² Virginia Department of Environmental Quality (VDEQ). Undated. Virginia Stormwater Management Handbook. Accessed from <http://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/HndbkVolumel.pdf>. Accessed on January 12, 2018.

⁹³ VDEQ. Undated. Virginia Erosion and Sediment Control Handbook. Accessed from <http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx>. Accessed January 12, 2018.

⁹⁴ DOEE. 2013. Stormwater Management Guidebook. Accessed from <https://doee.dc.gov/swguidebook>. Accessed January 12, 2018.

⁹⁵ Arlington County Department of Environmental Services. Stormwater Manual: A Guide to Stormwater Requirements for Land Disturbing Activities in Arlington County. January 2015. Accessed from <http://arlingtonva.s3.amazonaws.com/wp-content/uploads/sites/21/2014/06/DES-Stormwater-Management-Ordinance-Guidance-Manual.pdf>. Accessed January 12, 2018.

3.2.3. Wetlands and Other Waters of the U.S. Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- Section 401-404 of the CWA of 1972^{96,97,98,99}
- Section 10 of the Rivers and Harbors Act of 1899^{100,101}
- National Park Service (NPS) Director's Order 77-1 Wetland Protection¹⁰²
- NPS Director's Order 77-2 Floodplain Management¹⁰³
- EO 11990 of May 24, 1977: Protection of Wetlands¹⁰⁴
- U.S. Department of Transportation (USDOT) Order 5660.1A, Preservation of the Nation's Wetlands¹⁰⁵

Relevant Federal Guidance:

- There are no relevant Federal guidance for wetlands and other waters of the U.S.

3.2.4. Wetlands and Other Waters of the U.S. State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- Title 62.1, Code of Virginia, Waters of the State, Ports, and Harbors¹⁰⁶
- Title 28.2 (Chapters 12, 13, and 14), Code of Virginia¹⁰⁷
- Water Pollution Control Act of 1984¹⁰⁸

⁹⁶ 33 USC 1251

⁹⁷ 33 USC 1344

⁹⁸ 33 CFR 320

⁹⁹ 40 CFR 230

¹⁰⁰ 33 USC 403

¹⁰¹ 33 CFR 322

¹⁰² NPS Director's Order 77-1

¹⁰³ NPS Director's Order 77-2

¹⁰⁴ EO 11990

¹⁰⁵ USDOT Order 5660.1A

¹⁰⁶ Code of Virginia 62.1

¹⁰⁷ Code of Virginia Title 28.2

¹⁰⁸ DC Code 8-103.01

- DCMR Chapter 21-5, Water Quality and Pollution¹⁰⁹
- DCMR, Chapter 21-6, Riparian Rights and Water Privileges¹¹⁰

Relevant State and Local Guidance:

- There are no relevant state and local guidance for wetlands and other waters of the U.S.

3.2.5. Flood Hazards and Floodplain Management Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and EOs:

- National Flood Insurance Act of 1968¹¹¹
- FEMA National Flood Insurance Program
 - 44 CFR, Chapter 1, Subchapter B, Part 60 – Criteria for Land Management Use¹¹²
- EO 11988 of May 24, 1977: Floodplain Management¹¹³
- USDOT Order 5650.2, Floodplain Management and Protection (1979)¹¹⁴

Relevant Federal Guidance:

- There are no relevant Federal guidance for flood hazards and floodplain management.

3.2.6. Flood Hazards and Floodplain Management State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws and Regulations:

- Code of Virginia Section 10.1-602 – Floodplain Code¹¹⁵
- DCMR 20 Chapter 20-31 – Flood Hazard Rules¹¹⁶
- DC Construction Codes 2010¹¹⁷

¹⁰⁹ DCMR 21-5

¹¹⁰ DCMR 21-6

¹¹¹ 42 USC 4001

¹¹² 44 CFR 1B 60

¹¹³ EO 11988

¹¹⁴ DOT Order 5660.2.

¹¹⁵ Code of Virginia Section 10.1-602

¹¹⁶ DCMR 20-31

¹¹⁷ DCMR 20-31

- Arlington County Department of Environmental Services¹¹⁸
- Arlington County Code, Chapter 48, Floodplain Management¹¹⁹

Relevant State and Local Guidance:

- There are no relevant state and local guidance for flood hazards and floodplain management.

3.2.7. Chesapeake Bay Preservation Areas Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- EO 13508 of May 12, 2009: Chesapeake Bay Protection and Restoration¹²⁰

Relevant Federal Guidance:

- Chesapeake Bay Program¹²¹

3.2.8. Chesapeake Bay Preservation Areas State and Local Laws, Regulations, and Other Guidance

Arlington County adopted the Chesapeake Bay Preservation Ordinance (Arlington County Code, Chapter 61) to protect local streams and the Chesapeake Bay from pollution due to land use and development. All of Arlington County's water drains into the Potomac River and ultimately the Chesapeake Bay. To protect and improve the quality of these waterways, the ordinance establishes rules protecting sensitive surface waters/wetlands to include a 100-foot buffer restricting the discharge of pollutants resulting from development around tributaries, the shoreline, and delineated wetlands.

Relevant State, Local Laws, and Regulations:

- Chesapeake Bay Preservation Act of 1988¹²²
- Chesapeake Bay Preservation Area Designation and Management Regulations¹²³
- Chesapeake Bay Preservation Ordinance, Arlington County Code, Chapter 61¹²⁴

¹¹⁸ Arlington County Department of Environmental Services. Accessed from <https://departments.arlingtonva.us/des/>. Accessed January 12, 2018.

¹¹⁹ Arlington County Code Chapter 48

¹²⁰ EO 13508

¹²¹ Chesapeake Bay Program. Undated. Chesapeake Bay Program. Accessed from <https://www.chesapeakebay.net/>. Accessed February 7, 2018.

¹²² Code of Virginia 62.1

¹²³ 9 VAC 25-830

¹²⁴ Arlington County Code Chapter 61

Relevant State and Local Guidance:

- There are no relevant state and local guidance for Chesapeake Bay Preservation Areas.

3.2.9. Coastal Zone Management Federal Laws, Regulations, and Other Guidance

Coastal resources are governed by the CZMA and are also regulated by Virginia laws and regulations. The CZMA was created to preserve, protect, develop, and, where possible, restore or enhance coastal zones. Several Federal laws, regulations, and EOs outline acceptable processes that occur within and around coastal zones and coastal wetlands.

Relevant Federal Laws, Regulations, and EOs:

- CZMA¹²⁵
- CWA¹²⁶
- Rivers and Harbors Act of 1899¹²⁷
- EO 11990 of May 24, 1977: Protection of Wetlands¹²⁸
- SDWA of 1974¹²⁹

Relevant Federal Guidance:

- There are no relevant Federal guidance for coastal zone management.

3.2.10. Coastal Zone Management State and Local Laws, Regulations, and Other Guidance

Virginia participates in the National Coastal Zone Management Program and has a state management plan that includes Arlington County.

Relevant State, Local Laws, and Regulations:

- Virginia Executive Order 35 (2014), Continuation of the Virginia Coastal Zone Management Program¹³⁰

¹²⁵ 16 USC 1451

¹²⁶ 33 USC 1251

¹²⁷ 33 USC 401

¹²⁸ EO 11990

¹²⁹ 42 USC 300f

¹³⁰ Virginia Executive Order 35

- Virginia Tidal Wetlands Act¹³¹
- Virginia Submerged Lands¹³²

Relevant State and Local Guidance:

- There are no relevant state and local guidance for coastal zone management.

3.3. Study Area

3.3.1. Water Quality

The water quality Study Area boundary extends 500 feet from the Project footprint, to allow for evaluation of stormwater impacts to surface and groundwater resources and infrastructure both within and adjacent to the Project Area, as shown in **Figure 3-1**. Data were also collected adjacent to the Study Area from waters connected to resources within the Project footprint, as well as resources that may be affected, directly or indirectly, by the Project, especially when data sources within the Study Area were limiting. This was done to better characterize the overall water quality conditions of the surface waters within the Study Area. The Study Area is sufficient to quantify potential impacts to water quality from the Project at the local and watershed level, and a wider Regional Study Area is not necessary for this topic. For the purposes of this document, only data collected since 2007 were considered current enough to represent existing conditions in the Study Area.

3.3.2. Wetlands and Other Waters of the U.S.

The Study Area for delineating wetlands and other waters of the U.S. includes the immediate railroad corridor, bridge superstructure and pilings, abutments, and a corridor width of 500 feet on either side of the Project area, as shown in **Figure 3-2**. The Study Area encompasses all potential impacts, direct and indirect, to wetlands and other waters of the U.S., and a wider Regional Study Area is not necessary for this topic.

3.3.3. Flood Hazards and Floodplain Management

The Study Area for identifying flood hazards and floodplain management includes the immediate railroad corridor, bridge superstructure and pilings, abutments, and a corridor width of 500 feet on either side of the Project area, as shown in **Figure 3-3**. The Study Area encompasses all potential impacts to areas that fall within SFHAs associated with the Potomac River. Project, and a wider Regional Study Area is not necessary.

3.3.4. Chesapeake Bay Preservation Areas

The Study Area used for determining the extent of RPAs in Arlington County extends 500 feet from the Project area, as shown in **Figure 3-2**. This Study Area is sufficient to capture water resources and the RPA 100-foot buffer landward of tidal wetlands, nontidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow, and tidal shores. This Study Area is designated to

¹³¹ Code of Virginia 28.2

¹³² Code of Virginia 28.2

identify all potential impacts, direct and indirect, to RPAs, and a wider Regional Study Area is not necessary for this topic.

3.3.5. Coastal Zone Management

As shown in **Figure 3-3**, the Study Area for Coastal Zone Management extends 500 feet from the Project area, including areas that may be affected by the construction or operation of the Build Alternatives. This Study Area is designated to capture all relevant impacts to Coastal Zone Management, and a wider Regional Study Area is not necessary for this topic.

3.4. Affected Environment

3.4.1. Water Quality

This section describes the Study Area's ground and surface water quality; wetland delineation; and the management thereof, including flood preparedness.

Groundwater

The Study Area lies slightly east of the Fall Line between the Piedmont and Coastal Plain physiographic provinces. Under this northern part of the Coastal Plain province is a wedge-shaped mass of semi-consolidated to unconsolidated sediments, consisting of clay, silt, and sand, that rests on a surface of crystalline rock with small amounts of lignite and gravel.¹³³ Also present are some consolidated beds of limestone and sandstone. This local geology allows for many local aquifers to exist; however, similar hydrological characteristics lump these into six regional aquifers separated by four regional confining units within the Northern Atlantic Coastal Plain aquifer system. These aquifers are hydraulically interconnected to some degree, as water can leak through the confining units, allowing water to move readily. These aquifers, in descending order by proximity to the surface beginning with the shallowest, are the surficial aquifer, the Chesapeake aquifer, the Castle Hayne-Aquia aquifer, the Severn-Magothy aquifer, the Peedee-Upper Cape Fear aquifer, and the Potomac aquifer.

The regional Potomac aquifer, which underlies the Study Area, consists of the local Patapsco aquifer and the underlying local Patuxent aquifer, which is the deepest of these local aquifers. The Patuxent aquifer system is present throughout the Maryland Coastal Plain with a western boundary in the proximity of the Study Area.

¹³³ Trapp Jr., H., M.A. Horn. 1997. Groundwater Atlas of the United States: Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, West Virginia. Report #HA 730-L. United States Geological Survey. Reston, VA. Accessed from http://pubs.usgs.gov/ha/ha730/ch_l/index.html/. Accessed March 10, 2017.

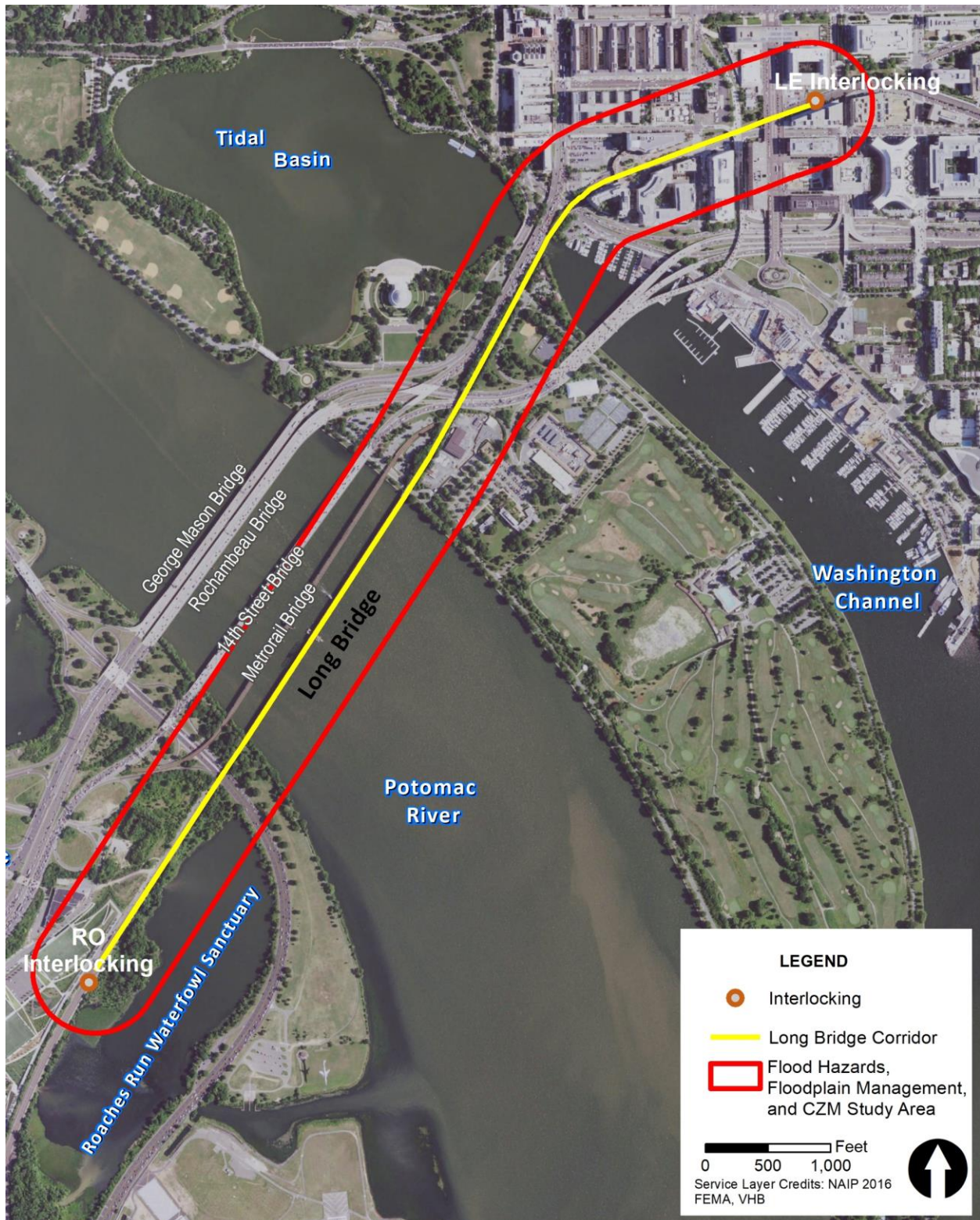
Figure 3-1 | Study Area for Water Quality



Figure 3-2 | Study Area for Wetlands, Other Waters of the U.S., and Virginia RPAs



Figure 3-3 | Study Area for Flood Hazards, Floodplain Management, and CZM



Based on the Natural Resources Conservation Service (NRCS) Soil Survey, the soils within the Study Area are listed as having a depth to groundwater of more than 80 inches. Most of the unconfined groundwater near the ground surface flows relatively short distances and discharges to nearby streams. A small amount of groundwater flows downward to recharge the deeper, confined aquifer.¹³⁴ For the Study Area, unconfined groundwater flows toward the Potomac River at the center of the Study Area. A small amount of groundwater will flow downward and east to the deeper confined Patuxent aquifer.

Residues of 19 types of pesticides were identified by USGS in 2005 and 2008 in the shallow groundwater of the nearby Anacostia River and Rock Creek watersheds.¹³⁵ Some of the reported pesticides were banned or restricted-use substances, and in concentrations exceeding human health or aquatic health guidelines. For instance, one sampling well less than 3 miles from the Study Area, WW Ca 32, exceeded 1999 Federal criteria for dieldrin in drinking water and fell within the range of concern for 2004 Federally approved non-regulatory USGS Health-Based Assessment benchmarks. Banned organic pesticides, like dieldrin, often exist as legacy contaminants due to their resistance to degradation.

Surface Water

The Project crosses and is adjacent to numerous waterbodies in the District and Virginia. Water quality and sewer systems are presented in **Figure 3-4**. Water quality is enforced at the state level by VDEQ and DOEE. Based on water quality standards for specific uses developed by the VDEQ and DOEE, respectively, waterbodies are determined to be meeting or not meeting those designated uses. As required in the CWA, if a waterbody is determined as not meeting its designated uses, it is considered impaired and the state must develop a water quality control plan to reduce pollutant contributions to the waterbody until the waterbody once again meets its designated uses. These water quality control plans are often Total Maximum Daily Loads (TMDLs), which define the total load of a pollutant that a waterbody can naturally assimilate and still meet its designated uses.

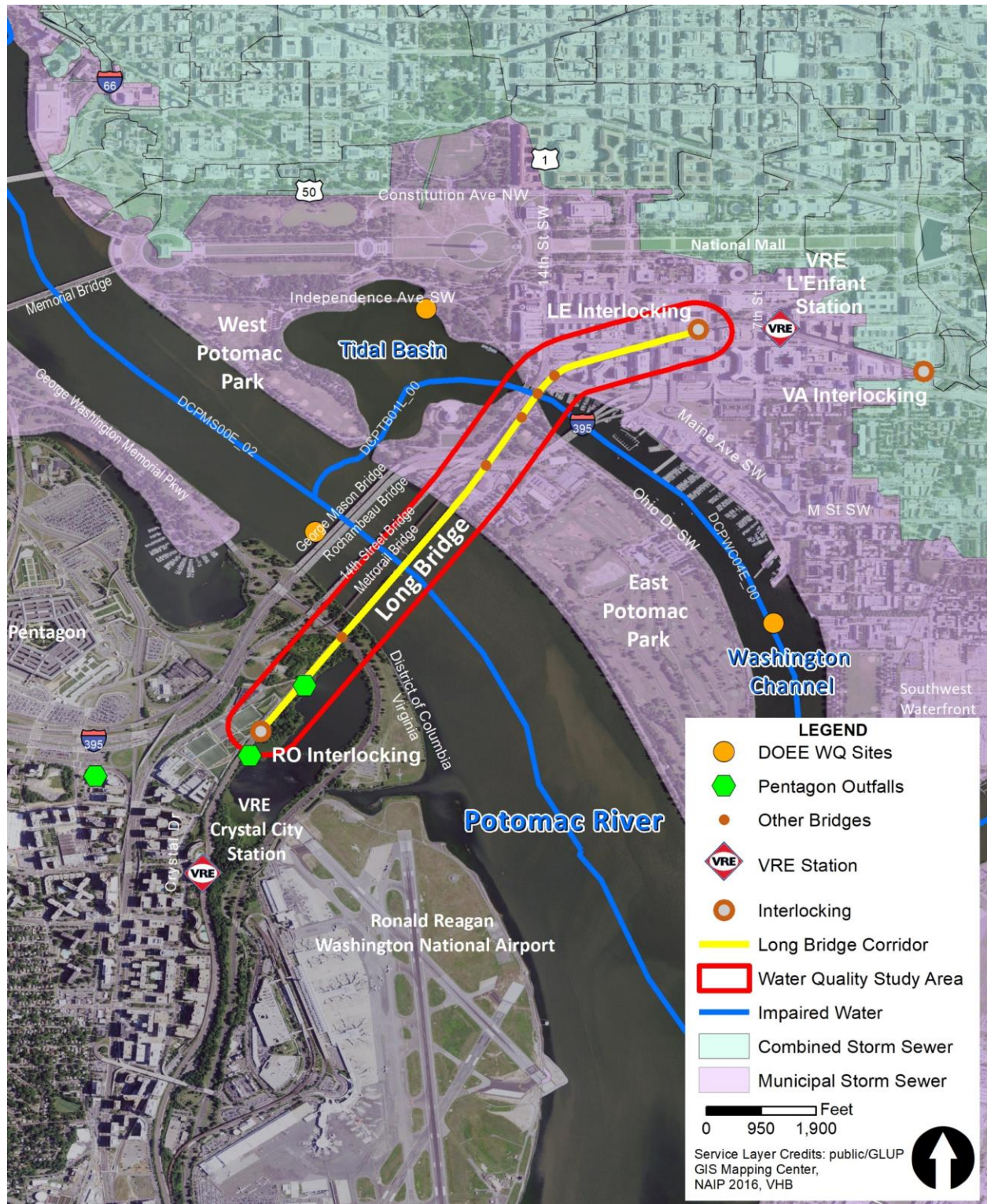
Point source discharges to waters of the U.S. are required under the CWA to obtain a permit under the NPDES.¹³⁶ Municipalities that own and operate drainage infrastructure must obtain a small municipal separate storm sewer system (MS4) permit to discharge to waterbodies. This permit requires six minimum control measures to limit discharge of pollutants and requires permittees to address impaired waters. The District and Arlington County both operate their drainage systems with MS4 permit coverage. The District's permit is issued by the EPA, while Arlington's permit is under the Virginia Pollutant Discharge Elimination System (VPDES) and issued by VDEQ.

¹³⁴ E. Randolph McFarland, USGS, Design, Revisions and Considerations for Continued Use of a Ground-Water-Flow Model of the Coastal Plain Aquifer System, WRIR 98-4085. Accessed from https://va.water.usgs.gov/online_pubs/WRIR/98-4085/g-wfmcpsys_va.html. Accessed April 20, 2018.

¹³⁵ Koterba, M.T., C.A. Dieter, and C.V. Miller. 2010. Pesticides in groundwater in the Anacostia River and Rock Creek watersheds in Washington, D.C., 2005 and 2008. Scientific Investigations Report 2010–5130. United States Geological Survey. Baltimore, MD.

¹³⁶ EPA. Undated. Waters of the United States under the Clean Water Act. Accessed from <https://www.epa.gov/cwa-404/definition-waters-united-states-under-clean-water-act>. Accessed January 9, 2017.

Figure 3-4 | Surface Waters, Sewer Systems, and Water Quality in the Study Area



The Study Area lies within the Potomac River-Pimmit Run Hydrologic Unit Code (HUC) watershed (12-digit Federal HUC 020700100103), which drains into the Potomac-Anacostia-Occoquan watershed (8-digit Federal HUC 02070010). The entire Study Area drains to the Potomac River, with the only identified tributary being Roaches Run, which joins the Potomac River from the east, just south of the Study Area. Other water features within the Study Area include the Tidal Basin and the Washington Channel, on the northwest side of the Potomac River, which are man-made impoundments within the existing Potomac River channel. The Potomac River is classified as a navigable waterway by USACE.

Three water quality monitoring stations (DOEE-PTB01, DOEE-PMS21, and DOEE-PWC04) are located within a 1.5-mile radius of the bridge and are operated by DOEE (**Figure 3-4**). These monitoring stations are located upstream of Theodore Roosevelt Island (Upper Potomac), within the Tidal Basin north of the 14th Street Bridge, west of the East Potomac Park (Middle Potomac), and within the Washington Channel east of East Potomac Park. Since the Study Area falls in the Middle Potomac River Segment in the District, all waters fall under the jurisdiction of the District and none are within Virginia; therefore, TMDLs follow the District's regulations. Three distinct segments exist within the Study Area: the Potomac River Mainstem, the Tidal Basin, and the Washington Ship Channel. The Potomac River Mainstem has completed TMDLs that include polychlorinated biphenyls (PCBs) and the pathogen, *Escherichia coli* (*E. coli*).^{137, 138} TMDLs are needed within the Potomac Mainstem for turbidity and pH. Within the Tidal Basin, TMDLs have been completed for *E. coli*, PCBs, and pH with additional impairments including chlordane, Dichlorodiphenyldichloroethane (DDD), dichlorodiphenyldichloroethylene (DDE), dichlorodiphenyltrichloroethane (DDT), dieldrin, heptachlor epoxide, and polycyclic aromatic hydrocarbons (PAHs). The Washington Ship Channel has completed TMDLs for *E. coli* and pH, and TMDLs are needed for DDD, DDE, DDT, dieldrin, heptachlor epoxide, PCBs, and PAHs. TMDLs for the Chesapeake Bay were issued in 2010 by the EPA for nitrogen, phosphorus, and sediment. These were finalized in 2004 and 2014 to include the Potomac River and its tributaries.

The current designated uses of the Potomac River and Washington Channel include secondary contact recreation and aesthetic enjoyment; protection and propagation of fish, shellfish, and wildlife; protection of human health related to consumption of fish and shellfish; and navigation (DC Law 5-188; DC Official Code § 8-103.04).¹³⁹ Primary contact recreation is not a current use; however, it is a designated use. A designated use is the future use to which a water body will be restored. **Table 3-1** includes general water quality criteria. The District has facility-wide numerical criteria for total suspended solids (TSS) discharges, based on the 2012 watershed-wide TMDLs in the Potomac River.

The Tidal Basin site generally meets standards, the Washington Channel site partially meets standards, and the Middle Potomac site does not meet standards (**Table 3-1**). Dissolved oxygen and temperature meet instantaneous minimum standards for all sites across all years. When sampled, pH, turbidity, and

¹³⁷ DOEE. 2014. The District of Columbia Water Quality Assessment: 2014 Integrated Report to the US Environmental Protection Agency and Congress Pursuant to Sections 305(b) and 303(d) Clean Water Act.

¹³⁸ DOEE. 2016. The District of Columbia Water Quality Assessment: 2016 Integrated Report to the US Environmental Protection Agency and Congress Pursuant to Sections 305(b) and 303(d) Clean Water Act Accessed from <https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/2016%20Final%20IR.pdf>. Accessed December 21, 2017.

¹³⁹ DC Law 5-188

secchi depth generally exceed standards. Chlorophyll-a generally meets standards except for a few instances where standards are exceeded 2.5 to 3.8 percent of the sampled years.

Table 3-1 | Water Quality Standards (WQS) for Designated Uses and the Percentage of Readings or Means Not Meeting WQS

Constituent	Criteria	Tidal Basin (Percent)			Middle Potomac (Percent)			Washington Channel (Percent)		
		2010	2011	2012	2010	2011	2012	2010	2011	2012
Fecal Coliform Single Sample Value	410 MPN/100 ml	m s	m s	7.7	20	30	33.3	m s	30	m s
Dissolved Oxygen										
Feb 1 – May 31 Instantaneous minimum	5.0 mg/L	m s	m s	m s	m s	m s	m s	m s	m s	m s
Jun 1 – Jan 31	3.2 mg/L	m s	m s	m s	m s	m s	m s	m s	m s	m s
Temperature Maximum	32.2°C	m s	m s	m s	m s	m s	m s	m s	m s	m s
pH	6.0-8.5	16.6	58.3	15.4	16.1	13.8	4.9	m s	2.1	m s
Turbidity	≤ 20NTU	50	m s	m s	40	20.5	4.9	m s	5.6	m s
Secchi Depth Apr 1 – Oct 31	0.8m	n/a	n/a	n/a	33.3	35.7	78.8	33.3	65	n/a
Chlorophyll-a Jul 1 – Sep 30	25µg/L	m s	m s	m s	m s	n/a	3.8	m s	2.5	m s

Source: 2017 Interstate Commission on Potomac River Basin, Potomac River Basin Atlas., DOEE 2016

Notes: "m s" refers to sites which met DOEE standards

Tidal Basin site corresponds to DOEE-PTB01, Middle Potomac site corresponds to DOEE-PMS21, Washington Channel site corresponds to DOEE-PWC04

As the result of the surrounding urban environment, the Potomac River, Tidal Basin, and Washington Channel are generally impaired for all designated uses, excluding navigation. This includes impairment for primary and secondary recreation, protection and propagation of fish, shellfish, and wildlife, and protection of human health related to consumption of fish and shellfish. In addition, these three segments within the Study Area are all impaired by and in need of TMDLs for a suite of chemical contaminants.

Arlington, Virginia

Within Arlington, Roaches Run is the one waterbody in the Project Area. The waterbody is approximately 67 acres in size, is adjacent to the George Washington Memorial Parkway (GWMP), and is part of Roaches Run Waterfowl Sanctuary.

According to the 2016 Draft Virginia Water Quality Assessment 305(b)/303(d) Integrated Report, Pimmit Run (segment ID VAN-A12R_ZZZ24A00 in **Figure 3-4**) is a Category 3A waterbody, indicating that not enough information is available to determine its impairment status.¹⁴⁰

Chesapeake Bay Watershed

The entire Project Area is within the Chesapeake Bay Watershed. In 2010, the EPA established the Chesapeake Bay TMDL encompassing the 64,000-square-mile watershed. According to the Chesapeake Bay TMDL Fact Sheet, “the TMDL identifies the necessary pollution reductions from major sources of nitrogen, phosphorus and sediment across the District of Columbia and large sections of Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia, and sets pollution limits necessary to meet water quality standards in the Bay and its tidal rivers.”¹⁴¹

Virginia and the District have been partners of the EPA’s Chesapeake Bay Program since the Chesapeake Bay Agreement in 1983 (revised 2000). The National Park Service (NPS) is a Federal agency partner. Virginia and the District are also signatories to the 2014 Chesapeake Bay Watershed Agreement.¹⁴² The Chesapeake Bay Agreement establishes goals and actions for protection and restoration of living resources, vital habitats, and water quality, as well as sound land use, stewardship, and community engagement. By 2025, the Chesapeake Bay Agreement partners aim to have all practices and controls installed to achieve the Bay’s dissolved oxygen, water clarity, submerged aquatic vegetation, and chlorophyll-*a* standards, as articulated in the Chesapeake Bay TMDL document.

¹⁴⁰ VDEQ. 2016. Draft Virginia Water Quality Assessment Report 305(b)/306(d) Integrated Report 2016. Accessed from http://www.deq.virginia.gov/Portals/0/DEQ/Water/WaterQualityAssessments/IntegratedReport/2016/ir16_Integrated_Report_Full_Draft.pdf. Accessed December 20, 2016.

¹⁴¹ EPA. Undated. Fact Sheet: Chesapeake Bay Total Maximum Daily Load (TMDL). Accessed from https://www.epa.gov/sites/production/files/2015-07/documents/bay_tmdl_fact_sheet.pdf. Accessed December 21, 2017.

¹⁴² Chesapeake Bay. 2014. Chesapeake Bay Watershed Agreement. Accessed from https://www.chesapeakebay.net/what/what_guides_us/watershed_agreement. Accessed November 16, 2017.

District of Columbia

Within the District, there are three connected waterbodies in the Project Area: the Potomac River, the Tidal Basin, and the Washington Channel. Information on each waterbody from the District of Columbia 2016 Integrated Report is provided below.¹⁴³

Potomac River

The middle segment of the Potomac River flows under the Long Bridge. This segment runs from Key Bridge to Hains Point. The Potomac River in this area is tidally influenced and flows to the Chesapeake Bay approximately 100 miles downstream.

This segment of the Potomac River is considered a Category 4A waterbody and is not supporting all designated uses.¹⁴⁴ The river is supporting its use of navigation, but not supporting the following uses:

- Primary contact recreation;
- Secondary contact recreation and aesthetic enjoyment;
- Protection and propagation of fish, shellfish, and wildlife; and
- Protection of human health related to the consumption of fish and shellfish.

The pollutants *E. coli*, pH, and polychlorinated biphenyls (PCBs) are listed as causing the impairment status.

The District Department of Health has developed a TMDL for fecal coliform bacteria that covers the middle segment of the Potomac River.¹⁴⁵ The TMDL was amended in 2014 to include *E. coli* bacteria load allocations.¹⁴⁶ For the middle basin of the Potomac River, the TMDL calls for a 50.5 percent reduction of *E. coli* from stormwater runoff.

To address the PCBs impairment, a TMDL was developed by VDEQ, the Maryland Department of the Environment, and DOEE. This TMDL requires a reduction of PCB inputs to the middle segment of the Potomac River of 98.5 percent.¹⁴⁷

¹⁴³ DOEE. 2016. District of Columbia Water Quality Assessment 2016 Integrated Report to the US Environmental Protection Agency and Congress Pursuant to Sections 305(b) and 303(d) Clean Water Act (P.L. 97-117). Accessed from <https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/2016%20Final%20IR.pdf>. Accessed December 21, 2017.

¹⁴⁴ Category 4a is a water body category that is impaired or threatened for one or more uses and a TMDL has been completed.

¹⁴⁵ District Department of Health, 2004. District of Columbia Final Total Maximum Daily Load for Fecal Coliform Bacteria in [Potomac River]. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/pftmdl_bac_pot_riv_trib.pdf. Accessed January 5, 2018.

¹⁴⁶ DOEE. 2015. Fecal Coliform Bacteria TMDL and *E. coli* Revision – Potomac River and Tributaries. Accessed from <https://doee.dc.gov/publication/fecal-coliform-bacteria-tmdl-and-e-coli-revision-potomac-river-and-tributaries>. Accessed January 5, 2018.

¹⁴⁷ DOEE. 2007. Total Maximum Daily Loads of Polychlorinated Biphenyls (PCBs) for Tidal Portions of the Potomac and Anacostia Rivers in the District of Columbia, Maryland, and Virginia. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/TidalPotomac_PCB_TMDL_Final01.pdf. Accessed January 5, 2018.

Washington Channel

The Washington Channel (segment ID DCPWC04E_00 in **Figure 3-4**) is a narrow channel between East Potomac Park and Water Street SW, east of the Project Area. It receives outflow from the Tidal Basin and flows into the Anacostia River just before its confluence with the Potomac River, south of the Project Area. The Channel is approximately 2 miles long with a maximum depth of 23 feet.¹⁴⁸

This waterbody is considered a Category 3 and Category 4A waterbody and is not supporting all designated uses.¹⁴⁹ The channel is supporting its navigation use, but not supporting the following uses:

- Primary contact recreation;
- Secondary contact recreation and aesthetic enjoyment;
- Protection and propagation of fish, shellfish, and wildlife; and
- Protection of human health related to the consumption of fish and shellfish.

The pollutants *E. coli*, pH, and PCBs (chlordane, DDD, DDE, DDT, Dieldrin, Heptachlor epoxide, and PAHs) are listed as causing the impairment status.

To address the *E. coli* impairment, a TMDL has been developed for the Washington Channel.¹⁵⁰ The TMDL sets an *E. coli* reduction requirement of 10 percent from both direct runoff and the storm sewer system. A TMDL for pH was developed for the Washington Ship Channel and approved in 2004.¹⁵¹ The TMDL states that no reduction in load is needed from direct runoff or the storm sewer system in the District. A TMDL has also been developed to address organics impairments to the Washington Ship Channel.

Table 3-2 shows the percent reduction required by the TMDL for each pollutant for both waterbody.¹⁵²

Table 3-2 | Washington Ship Channel and Tidal Basin Load Reduction Requirements

Pollutant	Percent Reduction
Chlordane	64
DDD	0
DDE	73
DDT	90
Dieldrin	0

¹⁴⁸ NOAA. BookletChart: Potomac River – Mattawoman Creek to Georgetown NOAA Chart 12289. Page 4. Accessed from http://www.charts.noaa.gov/BookletChart/12289_BookletChart.pdf. Accessed January 5, 2018.

¹⁴⁹ A Category 3 water body has insufficient or no data and information to determine if any use is attained

¹⁵⁰ DOEE. 2015. Tidal Basin and Washington Ship Channel Fecal Coliform Bacteria TMDL and Revised *E. coli* TMDL. Accessed from <https://doee.dc.gov/publication/tidal-basin-and-washington-ship-channel-fecal-coliform-bacteria-tmdl-and-revised-e-coli>. Accessed January 5, 2018.

¹⁵¹ District Department of Health, 2004. District of Columbia Final Total Maximum Daily Load for pH in Washington Ship Channel. Accessed from <https://doee.dc.gov/publication/washington-ship-channel-ph-tmdl>. Accessed January 5, 2018.

¹⁵² DOEE. 2011. Tidal Basin and Washington Ship Channel Organics TMDL. Accessed from <https://doee.dc.gov/publication/tidal-basin-and-washington-ship-channel-organics-tmdl>. Accessed January 5, 2018.

Heptachlor Epoxide	31
PAH1	0
PAH2	96
PAH3	93

Tidal Basin

The Tidal Basin (segment ID DCPTB01L_00 in **Figure 3-4**) is a tributary to the Washington Channel adjacent to the Jefferson Memorial, north west of the Project Area. The basin is a partially man-made reservoir with an area of approximately 107 acres. This waterbody is considered a Category 4A waterbody and does not support all of its designated uses. The basin is supporting its navigation use, but not supporting the following uses:

- Primary contact recreation;
- Secondary contact recreation and aesthetic enjoyment;
- Protection and propagation of fish, shellfish, and wildlife; and
- Protection of human health related to the consumption of fish and shellfish.

The pollutants *E. coli*, pH, and PCBs (chlordane, DDD, DDE, DDT, Dieldrin, Heptachlor epoxide, and PAHs) are listed as causing the impairment status.

To address the *E. coli* impairment, a TMDL has been developed for the Tidal Basin.¹⁵³ The TMDL sets an *E. coli* reduction requirement of 10 percent from both direct runoff and the storm sewer system. The TMDL states that no reduction in load is needed from direct runoff or the storm sewer system in the District. A TMDL has also been developed to address organics impairments in the Tidal Basin. **Table 3-2** shows the percent reduction required by the TMDL for each pollutant for both waterbodies.¹⁵⁴ There currently is no TMDL to address the pH impairment in the Tidal Basin.

Drinking Water

The Washington Aqueduct is the source of drinking water for both Arlington and the District. The Washington Aqueduct is managed by USACE and pulls water from two locations on the Potomac River: Great Falls and Little Falls, both of which are upstream of the Project Area. The Potomac River flows approximately 100 miles before joining with the Chesapeake Bay; there are likely communities that source their drinking water from downstream sections of the Potomac River.

Stormwater

The following sections discuss stormwater runoff from the Project Area. For the purposes of this evaluation, the Study Area extends 500 feet from the Project Area. This 500-foot buffer is assumed to capture the area within the Project Area that generates stormwater runoff.

¹⁵³ Tidal Basin and Washington Ship Channel Fecal Coliform Bacteria TMDL and Revised *E. coli* TMDL. 2015.

¹⁵⁴ Tidal Basin and Washington Ship Channel Organics TMDL. 2015.

Existing Stormwater Infrastructure

Stormwater runoff from the entire Project Area eventually makes it to the surface waterbodies discussed in the previous section. The majority of the Project Area is comprised of railroad track and ballast. In one section of the Project Area, the railroad is under Maryland Avenue SW and associated green space, and is assumed to not generate runoff since the green space serves as a permeable surface.

Portions of the project corridor have drainage swales parallel to the railroad tracks to collect runoff. Runoff would infiltrate through the ballast and into the subsurface soils, or be collected by a closed drainage system. Since Long Bridge has an open grated bridge deck, rainfall runs through the bridge directly to the Potomac River below. The existing railroad does not have drainage infrastructure nor information on such infrastructure; it is therefore assumed that, since there is no separate drainage system for the railroad, runoff from the railroad enters the surrounding District drainage infrastructure.

In Virginia, the railroad west of the George Washington Memorial Parkway (GWMP) is adjacent to Roaches Run and runoff from the railroad likely flows overland to this surface waterbody. There are two existing outfalls from the Pentagon property that flow under the railroad and discharge to Roaches Run adjacent to the Project Area, as shown in **Figure 3-4**.

In the District, the Project Area is within the District MS4 watershed and discharges to a surface waterbody. It is assumed that stormwater runoff from the Project Area reaches the Washington Channel, Tidal Basin, or the Potomac River, depending on the existing drainage infrastructure in place. The Project Area spans over the GWMP and the associated NPS MS4.

Typical Pollutants

Stormwater runoff can pick up any pollutants on the ground surface and carry them to waterbodies downstream. Pollutant sources in the Project Area include trains, aerial (atmospheric) deposition, and surrounding land uses.

Train operation may generate hydrocarbons from spills, drips, or exhaust. Additionally, lubricant and grease applied to the rails may contribute hydrocarbons to stormwater runoff. Train operation may also generate metals from the wear of wheels, breaks, and rails. Metals can collect on surfaces from aerial deposition and be washed off by stormwater in rain events. Animals nesting on bridges, underpasses, or other structures can be a source of pathogen pollutants. Additionally, trash generated from surrounding urban areas may blow and accumulate in the railroad line and be carried in stormwater to downstream waterbodies.

Ballast is made of stable, non-hazardous materials and is not considered a pollutant source in stormwater. The track and associated ballast are pervious surfaces and may allow for some infiltration of stormwater and filtering of pollutants. Pollutants can be adsorbed (attached) to the surface of the stone ballast. Each of these processes could limit the amount of pollutants in stormwater reaching downstream waterbodies. During larger storm events, when the storage capacity of the ballast is exceeded, the potential exists for some pollutants trapped in the ballast to be resuspended and conveyed to downstream water bodies.

Existing Stormwater Retention Volume

To set a baseline for evaluating stormwater, the existing stormwater retention volume was calculated. As little information is available on the existing stormwater infrastructure, a conservative approach has been taken to assume no retention or attenuation of stormwater occurs under existing conditions. Railroad ballast contains voids and pores that retain and reduce the velocity of stormwater runoff; however, without information on the presence of existing drainage infrastructure including discharge points and length of stormwater flow paths, this analysis assumed the Project Area is impermeable and smooth.

As it is anticipated that the project will not connect to the NPS MS4 in the vicinity of the GWMP, this watershed was not included in the analysis.

For this analysis, the stormwater retention volume for the Study Area from 1.2 inches of rainfall was calculated for each watershed. A rainfall event of 1.2 inches was chosen based on the DDOE Stormwater Management Guidebook guidance for calculating stormwater retention volume for major land-disturbing activity.

The watersheds, as discussed in the previous sections, include the District MS4 watershed, the Potomac River, and Roaches Run in Arlington, Virginia. The area within the Study Area and an estimation of stormwater retention volume for the Study Area are provided in **Table 3-3**.

Table 3-3 | Stormwater Retention Volume for the Project Area

Watershed	Study Area (sf)	Study Area (acres)	Stormwater Retention Volume (cf)
District MS4	756,151	17.4	75,615
Long Bridge (Potomac River)	461,077	10.6	46,108
Roaches Run	673,340	15.5	67,334
TOTAL	1,890,568	43.4	189,057

3.4.2. Wetlands and Other Waters of the U.S.

On November 8 and 22, 2017, the Study Area was field investigated to identify and survey the boundaries of waters of the U.S., including wetlands. Wetlands were identified in accordance with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and*

*Piedmont Region, Version 2.0.*¹⁵⁵ All identified waters of the U.S., including wetlands, were classified according to *A Classification of Wetland and Deep-Water Habitats in the United States.*¹⁵⁶

During the field investigation, three tidal waters and three tidal wetlands were identified within the Study Area. The tidal waters include Roaches Run in the southern portion of the Study Area; the Potomac River in the central portion of the Study Area; and the Washington Channel and Tidal Basin in the northern portion of the Study Area. All tidal waters were classified as riverine tidal (R1). Tidal wetlands include one palustrine scrub-shrub (PSS) wetland and a single palustrine forested (PFO) wetland, and a palustrine emergent system contiguous to Roaches Run in the southern portion of the Study Area. The locations of the delineated wetlands and watercourses are shown on **Figure 3-5**. A detailed description of each watercourse and wetland is included below. Wetland vegetation information is described in **Section 2.0, Natural Ecological Systems**.

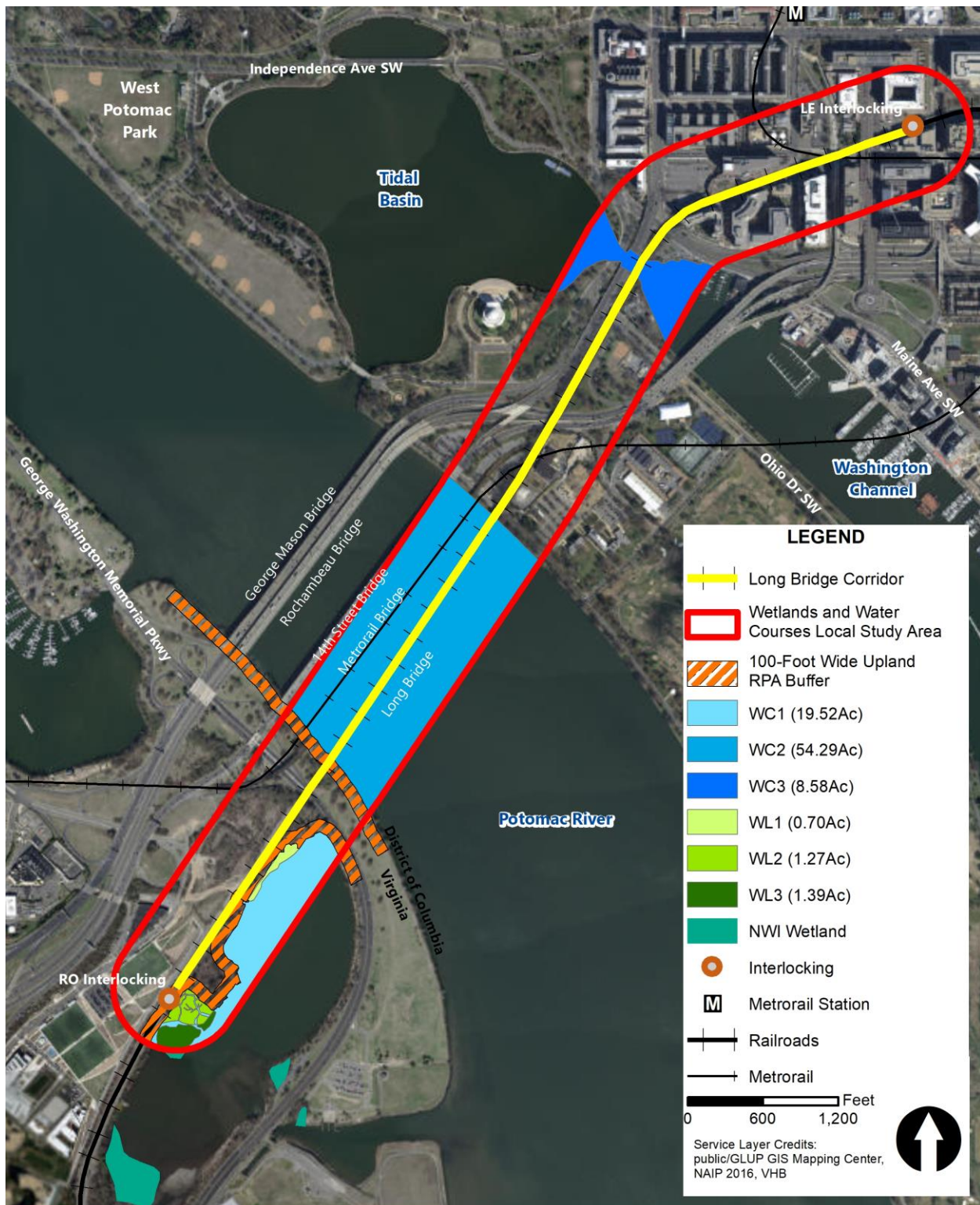
Watercourse 1 consists of Roaches Run, which is a tidal tributary to the Potomac River mainstem, and comprises 19.52 acres of the Study Area. Roaches Run is bound by the George Washington Memorial Parkway and Gravelly Point along the eastern edge, and the CSXT railroad line and Long Bridge Park along the western edge. Along the shoreline, the bottom appeared to consist of sand and silt, but increasing depth prevented a full determination of substrate. The National Wetlands Inventory (NWI) Cowardin classification of the system is Lacustrine Limnetic Unconsolidated Bottom Permanently Flooded-Nontidal (L1UBH). However, based on observations during the site visit, this system was classified as riverine tidal unconsolidated bottom permanently flooded-tidal (R1UBV).

Watercourse 2 is the Potomac River, which flows southeast and accounts for 54.29 acres of the Study Area. This watercourse is the primary drainage for the Study Area watershed, and is tidally influenced by the Chesapeake Bay, to which it ultimately drains. The eastern (Virginia) bank is bounded by a natural area that includes the Mount Vernon Trail, before elevations climb to meet the George Washington Memorial Parkway. The western (District) bank has a vertical bulkhead at the river's edge, with the adjacent uplands dominated by the East Potomac Park island complex. This watercourse was classified as riverine tidal, unconsolidated bottom, permanently flooded-tidal (R1UBV).

¹⁵⁵ U.S. Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-20. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

¹⁵⁶ U.S. Fish and Wildlife Services. 1979. Classification of Wetlands and Deepwater Habitats of the United States. eds. Cowardin LM, Carter V, Golet FC, LaRoe ET. Washington D.C. Report #FWS/OBS-79/31.

Figure 3-5 | Wetlands and Watercourses in the Local Study Area



Watercourse 3 is the Washington Channel and Tidal Basin, which lies on the District side of the Project and totals 8.58 acres within the Study Area. The Washington Channel/Tidal Basin is a man-made watercourse, created to control flooding through the building of the East Potomac Park island and the West Potomac Park peninsula. The Washington Channel is currently used as a marina for large boats for private and commercial activities. The Tidal Basin is used as a public recreation area, including paddle boat activities. The NWI classifies the two systems separately, with the Washington Channel classified as R1UBV, and the Tidal Basin as L1UBH; however, since the two systems are connected, and both connect to the Potomac River, the system was delineated as one continuous system for this investigation. Based on observations during the site visit, this entire system was classified as R1UBV. A portion of Watercourse 3 extends along the National Mall and Memorial Parks Headquarters property.

Wetland 1 totals 0.70 acres in size, and is a Roaches Run fringe wetland that abuts a narrow strip of early-successional forest located south of the CSXT railroad in the southwestern portion of the Study Area. This system was classified as palustrine scrub-shrub broad-leaved deciduous, seasonally flooded tidal (PSS1R) (see also **Figure 2-2**).

Wetland 2 totals 1.27 acres in size and is a floodplain wetland fragmented by several tidal guts contiguous with Roaches Run. Wetland 2 is located southwest of Wetland 1 in the southwestern portion of the Study Area. This system was classified as palustrine forested broad-leaved deciduous, seasonally flooded tidal (PFO1R).

Wetland 3 is freshwater tidal marsh classified as a palustrine, non-persistent emergent system (PEM2R) contiguous with western shoreline of Roaches Run and found at the southern end of the Study Area. Approximately 1.39 acres of this wetland occurs within the Study Area, and the remainder of the marsh extends further south.

3.4.1. Flood Hazards and Floodplain Management

Flood Insurance Rate Maps (FIRMs)¹⁵⁷ and Digital Flood Insurance Rate Maps (DFIRM)¹⁵⁸ were used to identify floodplains within the Study Area.

Mapped 100-year (1 percent annual chance floodplain) and 500-year floodplains (0.2 percent chance annual floodplain) within the overall Study Areas are located along Roaches Run, the mainstem of the Potomac River, the Washington Channel, and the Tidal Basin, as show in **Figure 3-6**.^{159,160} The base flood elevation, which is the computed elevation that floodwater is expected to rise during the 100-year flood (the base flood), within the Study Area is between 11 and 12 feet and the majority of the Study Area

¹⁵⁷ Federal Emergency Management Agency (FEMA). 2015. Federal Flood Risk Management Standard (FFRMS). Available Accessed from <http://www.fema.gov/federal-flood-risk-management-standard-ffrms>. Accessed May 3, 2018.

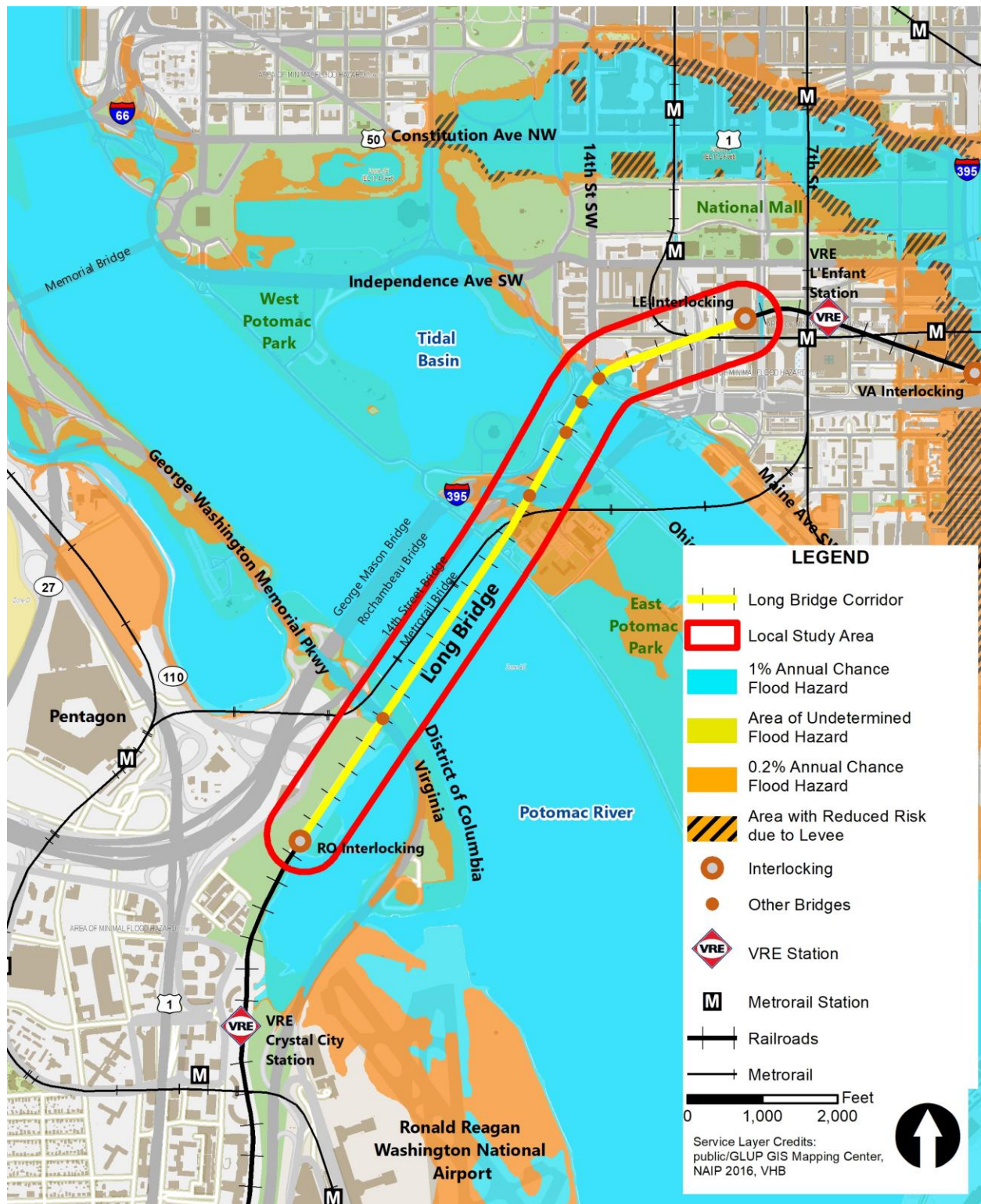
¹⁵⁸ DOEE. 2010. Digital Flood Insurance Rate Map (DFIRM). Accessed from http://maps2.dcgis.dc.gov/dcgis/rest/services/DCGIS_DATA/Environment_WebMercator/MapServer/8. Accessed May 3, 2018.

¹⁵⁹ For floodplain information for the DC and Potomac to the Virginia Shoreline: FEMA. 2010. Flood Insurance Rate Map 110001 0018C, 0049C, 0056C, and 0057C dated effective September 27, 2019; and FEMA. 2016. Letter of Map Revisions Case No 15-03-2388P, Issued May 26, 2016.

¹⁶⁰ For floodplain information for Virginia: FEMA. 2013. Flood Insurance Rate Map 51013C 0081C, 0043C, dated effective August 19, 2013.

contains 100-year and 500-year floodplains. Ranging from less than 200 feet to more than 3,000 feet in width, these floodplains fall within densely developed or grassy maintained areas.

Figure 3-6 | Flood Hazard Zones



Intensity of flooding is not impacted by the immediate surroundings given the size of the water body and its contributing watershed. The Potomac River at the Study Area is a large river basin with a drainage area of over 11,560 square miles, and a 100-year flood discharge of more than 475,000 cubic feet per second.¹⁶¹ The extent of flooding is shaped by the infrastructure and natural areas that are near, upstream, and downstream of the Project. Flood hazard zones are presented in **Figure 3-6 | Flood Hazard Zones**.

Floods along the Potomac River generally result from a combination of tidal effects and fluvial flows upstream of the District. Flood flows combined with high tide elevations produced record flood flows in 1889 and 1936. As a result of the 1936 flood, a flood control project to construct earthen levees within the District was authorized by the Flood Control Act of 1936 and completed in 1939.¹⁶² These levees were constructed to reduce floodwater access to the National Mall area of the District. Due to the heavily urbanized nature of the District and adjacent Arlington County, the shoreline is a mosaic of natural areas and hardened shorelines, some including temporary floodwalls, like those at the Washington Harbor upstream of the subject area in Georgetown. Given that the Potomac is a large river, neither the large floodplains nor the natural communities and manmade infrastructure within the flood zones are foreseen to be impacted by the Project.

The flood control infrastructure built under the Flood Control Act of 1936 includes the 17th Street levee system, which is located upstream of the study area. This levee system includes an approximately 12-foot-high earthen levee that runs along the Lincoln Memorial Reflecting Pool, a floodwall closure at 17th Street NW, and temporary sandbag closures at 23rd Street and Constitution Avenue, and along P Street SW. The levees and closures function as a system to provide flood-risk management. The levee system is regulated by the USACE and operated and maintained by NPS. The 17th Street closure is a removable structure that can be erected in the event of high water to attach to the floodwalls on both sides of 17th Street and consists of aluminum panels between steel posts. Stone cladding application on the 17th Street floodwall was designed to blend in with the historic landscape of the National Mall. The closure is part of the Potomac Park Levee System and the Washington, DC and Vicinity Local Flood Protection Project. In 2016, FEMA “accredited” the levee system and issued a revised flood insurance rate map for the District. This map includes localized flooding hazards in the Federal Triangle Area, and other vulnerable low-laying areas of the District,¹⁶³ but it does not revise the flood hazard at the Study Area.

¹⁶¹ FEMA. Undated. Flood Insurance Study (FIS) District of Columbia, 110001V00A, Revised September 27, 2010.

¹⁶² Flood Insurance Study (FIS) District of Columbia.

¹⁶³ USACE. October 31, 2014. D.C. Levee closure construction completed at 17th street – improvements will better protect Federal Triangle and residents. Accessed from <http://www.nab.usace.army.mil/Media/News-Releases/Article/547399/dc-levee-closure-construction-completed-at-17th-street-improvements-will-better/>. Accessed May 3, 2018.

3.4.1. Chesapeake Bay Preservation Areas

In addition to the waterbodies and wetlands, several RPA upland buffers are present in Arlington County within the Study Area along the west boundary of the Potomac River, on the northern boundary of Roaches Run, and along tidal wetlands contiguous to Roaches Run, as shown in **Figure 3-6**. The area within the delineated RPA buffer along the Virginia side of the Potomac River consists of transportation corridors and maintained park land with scattered trees. Along Roaches Run and its contiguous wetlands, the RPA buffer consists of mostly disturbed forest and scrub-shrub vegetation, although the CSXT tracks also cross portions of the RPA.

3.4.2. Coastal Zone Management

Virginia's coastal zone includes the Tidewater region, including 29 counties, 15 cities, and 42 towns. Four tidal rivers are included in this zone, including the Potomac River and its direct tributaries; therefore, the entire Study Area within Virginia is included in Virginia's designated coastal zone. Pursuant to Section 307 of the CZMA and NOAA Federal Consistency Regulations, all Federal development projects inside Virginia's designated coastal zone are automatically subject to the consistency regulations and require a Federal consistency determination.¹⁶⁴ Once a method of construction and project impacts are identified, a reasonably foreseeable effects test will need to be conducted and submitted to VDEQ for the determination.

¹⁶⁴ 15 CFR 930. Coastal Zone Management Act of 1972. Accessed from <https://www.ecfr.gov/cgi-bin/text-idx?SID=a6b4a763b718376a443d00f82b467e7d&mc=true&node=pt15.3.930&rgn=div5>. Accessed May 1, 2018.

4.0 Geologic Resources

4.1. Overview

This section describes the geologic and soil resources within the Study Area. This section includes information on geologic and soils resources, geologic formations or features, such as point bar deposits, creek and river channels, sediments, and banks, and other Coastal Plain sediments that comprise the foundation upon which the Project will be constructed. Geologic hazards are also described in this section and refers primarily to seismic, or ground-shaking, events that would be accounted for in the design criteria.

4.2. Regulatory Context

4.2.1. Geologic Resources U.S. Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- There are no relevant Federal laws, regulations, and EOs for geologic resources.

Relevant Federal Guidance:

- There are no relevant Federal guidance for geologic resources.

4.2.2. Geologic Resources State and Local Laws, Regulations, and Other Guidance

Relevant State and Local Laws and Regulations:

- There are no relevant state and local laws, regulations for geologic resources.

Relevant State and Local Guidance:

- There are no relevant state and local guidance for geologic resources.

4.3. Study Area

The Study Area is based on an estimated area for the Limits of Disturbance (LOD) required for construction and construction access and staging. The extent of the LOD are currently being investigated and are not yet well defined. Therefore, for the purposes of the Affected Environment analysis, the Local Study Area was defined as a 0.5-mile buffer around the Project corridor (**Figure 4-1**), and the Regional Study Area considered the DC region, which encompasses the geologic resources of interest for the Project.

Figure 4-1 | Local Study Area for Geologic Resources



4.4. Methodology

The geologic and soil resources within the Study Area were investigated, including the features, location, and condition within the Study Area. Information was gathered from available data online, available reports and data such as subsurface investigations completed for the Project or nearby projects, Natural Resources Conservation Service (NRCS) soil surveys, geologic mapping, reports, and local Geographic Information Systems (GIS) data. Estimates of the size and extent of the resources were mapped using GIS. Key features of the resources described include:

- Upland soil types, texture, percent slope, erodibility;
- Estuarine sediment types, texture, slope conditions, erodibility;
- Geomorphic features such as bars, channels, and river banks; and
- Geological hazards such as faults or potential earthquake zones.

4.5. Affected Environment

This section characterizes existing land forms, geologic, and soil conditions in the Local and Regional Study Area.

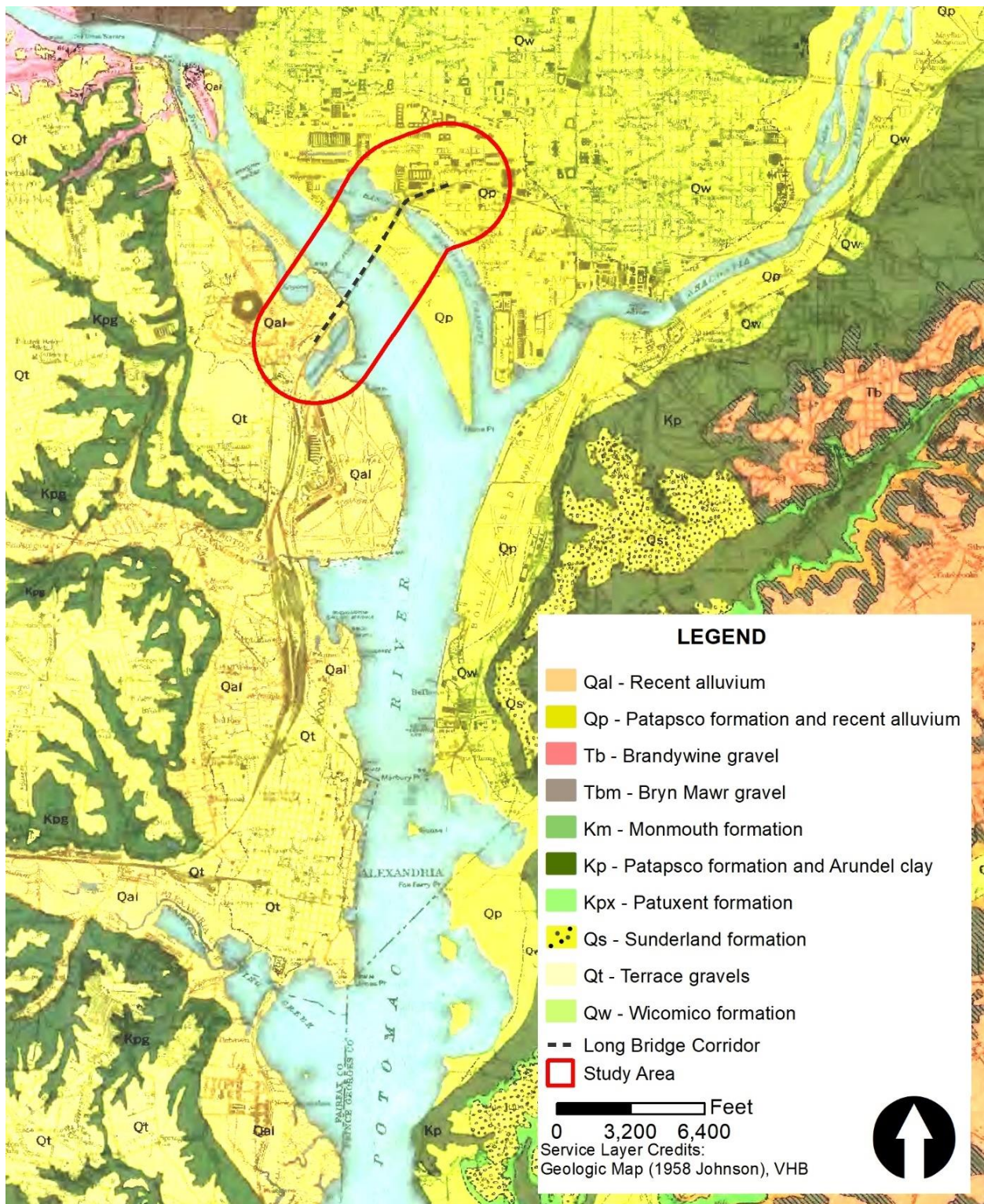
4.5.1. Geology and Soils

The proposed Project is located entirely within the Coastal Plain physiographic province. The Fall Line, which separates the Piedmont physiographic province from the Coastal Plain province, is located approximately 2.5 miles upstream of the Local Study Area near Theodore Roosevelt Island and the Frances Scott Key Bridge.¹⁶⁵ To the east of the Fall Line are more recent Coastal Plain sediments that are found upon the older, harder basement rocks of the Piedmont. Within the Local Study Area, the United States Geological Survey (USGS) map shows mapped deposits on the Virginia side of the Potomac River as recent alluvium (Qal), while deposits mapped within the District are shown as Patapsco Formation and recent alluvium (Qp) (**Figure 4-2**). The USGS defines alluvium as a general term for clay, silt, sand, gravel, or similar unconsolidated detrital material that was deposited during recent geologic time by a stream or other body of running water, as a sorted or semi-sorted sedimentary deposit.¹⁶⁶ Recent alluvium sediments are also found within the Potomac River, upstream and downstream of Long Bridge and within the Local Study Area.

¹⁶⁵ Johnston, Paul M. 1964. Geology and Ground-Water Resources of Washington D.C., and Vicinity. Geological Survey Water-Supply Paper 1776. Plate 1 – Geologic Map of Washington, D.C. and Vicinity. Accessed from <https://pubs.usgs.gov/wps/1776/report.pdf>. Accessed May 3, 2018.

¹⁶⁶ United States Geological Survey. Undated. Mineral Resources On-Line Spatial Data. Accessed from <https://mrdata.usgs.gov/geology/state/sgmc-lith.php?text=alluvium>. Accessed May 3, 2018.

Figure 4-2 | Geologic Map of the District of Columbia and Vicinity



As shown in **Figure 4-3**, NRCS soil surveys map the majority of the Local Study Area as Udorthents and Urban Land soils.^{167,168} Udorthents are described as deep or very deep, well-drained or somewhat excessively drained, nearly level to very steep, loamy and clayey soils. Udorthents mostly consist of disturbed soils that could be overburden surface materials stripped from previous mining activities or other land disturbance activities. Unvegetated areas of Udorthents can be susceptible to severe erosion, according to the NRCS soils report. Urban Land soils are described as areas covered by impervious materials such as asphalt, concrete, buildings, parking lots, and other man-made structures. The Virginia segment of the Local Study Area is comprised of approximately 70 percent Urban Land-Udorthents that are found as passive park lands, sports fields, and other vegetated areas. The remainder of the Local Study Area within Virginia is open water (a tidal pond that is connected to the Potomac River through a culvert under the George Washington Memorial Parkway). The northern segment of the Local Study Area is much more developed, with approximately 75 percent of the area classified as Urban Land, while Udorthents soils are approximately 20 percent of the Project Area, and the remaining 5 percent is within tidal waters. Much of this area comprises park land administered by NPS.

4.5.2. Geomorphic Features

Typical geomorphic features associated with Coastal Plain rivers include floodplains; levees; river banks; a thalweg, or the deepest point of the river normally associated with the navigation channel; and shallower, broad flats within the river bottom. The Local Study Area contains all these features, although some have been altered through man-induced activities. Segments of both the northern and southern sections of the Local Study Area extend onto floodplains that border the Potomac River (see **Section 3.0, Water Resources** for detailed mapping). As mentioned in **Section 4.5.1, Geology and Soils**, the floodplain areas are comprised of Urban Lands and Udorthents soils, which have been disturbed through various activities such as mining or other land excavation and fill activities.

The river bank along the Virginia shoreline is more natural, with a sloped bank that has various woody and herbaceous plants growing within the bank and along the top of the bank. Some locations have larger rock materials installed upon the bank to slow the erosional forces of the river.

The river bank along the District shoreline has been hardened with a vertical bulkhead, or seawall, supporting a pedestrian walkway that extends through the Local Study Area. Both river banks extend approximately 1,000 linear feet from the upstream to downstream limits of the Local Study Area. There do not appear to be any natural levee features that typically form along the riverside flanks of a floodplain.

¹⁶⁷ Harper, John David. 2007. Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey of Arlington County, Virginia. Accessed from <https://websoilsurvey.nrcs.usda.gov/>. Accessed May 3, 2018.

¹⁶⁸ Smith, Horace. 1976. Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey of District of Columbia, Virginia. Accessed from <https://websoilsurvey.nrcs.usda.gov/>. Accessed May 3, 2018.

Figure 4-3 | NRCS Soil Survey of Arlington County and District of Columbia



4.5.3. Geologic Hazards

The Central Virginia Seismic Zone is the nearest seismic zone to the Local Study Area. The Local Study Area is situated within an area mapped as having a 6 to 8 percent peak ground acceleration (PGA), a measure of how hard the earth shakes at a given point, for a 2 percent probability of exceedance in a 50-year period.¹⁶⁹ On August 23, 2011, an earthquake with a magnitude of 5.8 occurred with an epicenter area of Louisa County, Virginia, and may have been the most widely felt earthquake in U.S. history.¹⁷⁰ The 2011 earthquake caused significant damage to the Washington Monument, resulting in a 2.5-year, \$15 million restoration project; there were no reports of damage sustained by bridges.

¹⁶⁹ Petersen et. al. 2014. Documentation for the 2014 Update of the United States National Seismic Hazard Maps. Accessed from <https://pubs.usgs.gov/of/2014/1091/pdf/ofr2014-1092.pdf>. Accessed May 3, 2018.

¹⁷⁰ Horton, J.W. Jr. and R.A. Williams. 2012. The 2011 Virginia Earthquake: What are Scientists Learning? EOS Trans. AGU 93(33), 317. Accessed from <http://onlinelibrary.wiley.com/doi/10.1029/eost2012E033/epdf>. Accessed May 3, 2018.

5.0 Solid Waste

5.1 Overview

This section discusses the affected environment involving solid waste disposal and the potential for hazardous materials impacts. The improper disposal of solid waste and hazardous waste can create adverse impacts to human health and the environment; therefore, ensuring that solid waste and hazardous materials products and sites are managed in an environmentally sound manner is crucial. In addition, the Federal Transit Administration (FTA) is concerned with the effect that the management requirements of solid waste and discovery of hazardous materials within a proposed project area may have on timely completion of a project.¹⁷¹

As it relates to the Project, the Federal Railroad Administration (FRA) Procedures for Considering Environmental Impacts, under the topic of solid waste disposal, states “The alternatives should be assessed with respect to State and local standards for sanitary landfill and solid waste disposal.”¹⁷² Under the topic of public safety, the FRA policy states “The Environmental Impact Statement (EIS) should assess the transportation or use of any hazardous materials which may be involved in the alternatives, and the level of protection afforded residents of the affected environment from construction period and long-term operations associated with the alternatives.”¹⁷³

5.1.1. Solid Waste

The Resource Conservation and Recovery Act of 1976 (RCRA) created a framework for the U.S. Environmental Protection Agency (EPA) to regulate what is known as “solid waste.”¹⁷⁴ Solid waste includes both hazardous and non-hazardous wastes. The EPA defines solid waste as any “garbage or refuse, sludge for a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, resulting from industrial, commercial, mining, and agricultural operations, and from community activities.”¹⁷⁵ Hazardous wastes are certain solid wastes that require additional regulation because they are dangerous or known to be harmful to human health or the environment. Therefore, the term “solid waste” does not imply the waste is non-hazardous. Rather, solid waste is the broader term used to describe wastes regulated by RCRA, which also includes construction debris and excavated soils.

¹⁷¹ Federal Transit Administration. Undated. Environmental Resources Information. Accessed from <https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/environmental-resources-information-0>. Accessed January 15, 2018.

¹⁷² 64 FR 28545

¹⁷³ 64 FR 28545

¹⁷⁴ U.S. Environmental Protection Agency (EPA). Undated. Resource Conservation and Recovery Act (RCRA) Laws and Regulations. Accessed from <https://www.epa.gov/rcra>. Accessed June 5, 2017.

¹⁷⁵ EPA. Undated. Criteria for the Definition of Solid Waste and Solid and Hazardous Waste Exclusions. Accessed from <https://www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and-hazardous-waste-exclusions#solidwaste>. Accessed April 30, 2018.

At a Federal level, non-hazardous industrial solid waste and municipal solid waste (MSW) are managed under the Solid Waste Program (RCRA Subtitle D), which sets criteria for municipal solid waste landfills and other solid waste facilities, and prohibits the open dumping of solid waste.¹⁷⁶ Methods specific to hazardous waste management are described in **Section 5.1.2, Hazardous Materials**.

5.1.2. Hazardous Materials

The term “hazardous materials” is a broader term collectively used to describe:

- Hazardous wastes (as defined by RCRA and detailed in Section 5.1.1);¹⁷⁷
- Hazardous substances (as defined in the Comprehensive Environmental Response, Compensation and Liability Act [CERCLA] section 101[14] and listed at 40 CFR 302 to include listed hazardous wastes or unlisted solid wastes that exhibit specific characteristics such as ignitability, corrosivity, reactivity or toxicity characteristic);¹⁷⁸
- Asbestos (referring to the naturally occurring fibrous minerals used in many commercial and industrial applications, also defined under 40 CFR 302 as a hazardous substance);¹⁷⁹ and
- Petroleum products (materials derived from crude oil such as fuel oil and gasoline).

The Occupational Safety and Health Administration (OSHA) also defines hazardous materials as any substance or chemical which is a “health hazard” or “physical hazard” as defined by 29 CFR 1910.1200.¹⁸⁰

The U.S. Department of Transportation (USDOT) defines hazardous materials as “a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and has designated as hazardous under section 5103 of Federal hazardous materials transportation law (49 USC 5103).”¹⁸¹

Certain properties may be contaminated by releases or spills of hazardous materials. The remediation of these contaminated sites is regulated by several Federal laws, including CERCLA, also known as “Superfund.”¹⁸² Under the RCRA Corrective Action Program implemented under 40 CFR 264, facilities that cause these releases must conduct investigations and remediate the contamination to protect human health and the environment. Virginia is authorized to implement their own Corrective Action programs, while EPA Region 3 implements the Correction Action program for the District. State-specific regulations also exist for managing contaminated sites, as noted in **Section 5.2.2**.

¹⁷⁶ EPA. Undated. Regulatory Information by Topic: Waste. <http://www2.epa.gov/regulatory-information-topic/waste#solid>. Accessed June 5, 2017.

¹⁷⁷ 42 USC 6309

¹⁷⁸ 40 CFR 302

¹⁷⁹ 40 CFR 302

¹⁸⁰ 29 CFR 1910

¹⁸¹ 49 CFR 171.8

¹⁸² 42 USC 103

5.2. Regulatory Context

The following laws, regulations, agency jurisdictions, and guidance are pertinent to solid waste disposal and hazardous waste resources. Key regulations and guidance that are most relevant to the Project are listed below.

5.2.1. Solid Waste Federal Laws, Regulations, and Other Guidance

At a Federal level, non-hazardous industrial solid waste and MSW are managed under the Solid Waste Program (RCRA Subtitle D), which sets criteria for municipal solid waste landfills and other solid waste facilities, and prohibits the open dumping of solid waste.¹⁸³ The Hazardous Materials Transportation Act (49 USC 5101 et seq.) is applicable to the transportation of hazardous materials in commerce, including interstate and intrastate carriers.¹⁸⁴ Hazardous materials in railroad cars may only be shipped by persons registered by the USDOT and the hazardous material must be properly classed, described, packaged, marked, labeled, and in condition for shipment. OSHA's Hazardous Communication Standard (HCS) also provides standards for hazardous material classification, labeling, and worker training. OSHA also regulates the health and safety requirements for workers engaged in hazardous waste operations as well as the appropriate storage and handling of hazardous materials under 29 CFR 1910.120 and 1926.65, also known as the Hazardous Waste Operations and Emergency Response (HAZWOPER) standards.^{185,186}

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- RCRA of 1976^{187,188}
- CERCLA of 1980^{189,190}
- Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986^{191,192}
- Small Business and Liability Relief and Brownfields Revitalization Act of 2002¹⁹³
- Solid Waste Disposal Act of 1965¹⁹⁴

¹⁸³ EPA. Undated. Regulatory Information by Topic: Waste. Accessed from <http://www2.epa.gov/regulatory-information-topic/waste#solid>. Accessed June 5, 2017.

¹⁸⁴ 49 USC 5101

¹⁸⁵ 29 CFR 1910.120

¹⁸⁶ 29 CFR 1926.65

¹⁸⁷ 42 USC 6901

¹⁸⁸ 40 CFR 239

¹⁸⁹ 42 USC 9601

¹⁹⁰ 40 CFR 300

¹⁹¹ 42 USC 11001

¹⁹² 40 CFR 350

¹⁹³ 42 USC 9601

¹⁹⁴ 42 USC 9601

- Energy Policy Act of 2005¹⁹⁵
- American Recovery and Reinvestment Act of 2009¹⁹⁶
- Toxic Substances Control Act (TSCA) of 1976,¹⁹⁷ including the Asbestos Hazard Emergency Response Action (AHERA)¹⁹⁸
- OSHA Lead in Construction Standard¹⁹⁹
- RCRA and Superfund Amendments and Reauthorization Act of 1986²⁰⁰
- Hazardous and Solid Waste Amendments of 1984²⁰¹
- Federal Insecticide, Fungicide, Rodenticide Act of 1910²⁰²
- Standards for the Use or Disposal of Sewage Sludge under the Clean Water Act (CWA) of 1972²⁰³
- EO 12088 of October 13, 1978: Federal Compliance with Pollution Control Standards²⁰⁴
- EO 13101 of September 14, 1998: Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition²⁰⁵

Relevant Federal Guidance:

- FRA Procedures for Considering Environmental Impacts²⁰⁶

5.2.2. Solid Waste State and Local Laws, Regulations, and Other Guidance

Under RCRA, the District of Columbia and Virginia have the authority to ensure safe and effective hazardous waste management and to establish a program to regulate the generation, storage, transportation, treatment, and disposal of hazardous waste on land under District Law 2-64, District Code 8-1301 to 8-1322, and Virginia Code 10.1-1400 et seq. Following excavation for work occurring

¹⁹⁵ 42 USC 13201

¹⁹⁶ Public Law 111-5

¹⁹⁷ 15 USC 53

¹⁹⁸ 15 USC 2651

¹⁹⁹ 29 CFR 1926.62

²⁰⁰ 42 USC 6901

²⁰¹ 42 USC 6901

²⁰² 7 USC 136

²⁰³ Pertains to land application (and biosolids composting), surface disposal, and combustion of biosolids (sewage sludge). Standards in this rule are also applicable to municipal solid waste compost.

²⁰⁴ EO 12088

²⁰⁵ EO 13101

²⁰⁶ 64 FR 28545

within the Potomac River, soil that needs to be transported via vessel must be done in accordance with United States Coast Guard regulations.²⁰⁷

Regional and local governments have been given the regulatory power to enact their own ordinances and develop regulations regarding solid waste management. Municipalities can control local solid waste sites and recycling centers.²⁰⁸

The Arlington County, Virginia, solid waste ordinances govern the storage, collection, transportation, processing, and disposal of solid waste as well as the recovery of recyclable materials and other resources from solid waste within Arlington County.

Relevant State and Local Laws and Regulations:

- Virginia Solid Waste Management Regulations²⁰⁹
- Virginia Waste Management Act²¹⁰
- District of Columbia Illegal Dumping Enforcement Amendment Act of 1994²¹¹
- Green Construction Code, Sections 406 and 503 of Title 12K of the District of Columbia Municipal Regulations²¹²
- District of Columbia Hazardous Waste Regulations²¹³
- Government of the District of Columbia Department of Environment and Energy (DOEE) Control of Asbestos²¹⁴
- Fire Prevention Code²¹⁵
- Garbage, Refuse, and Weeds²¹⁶

²⁰⁷ 49 CFR 171-180

²⁰⁸ EPA. Undated. Municipal Solid Waste Landfill. Accessed from <https://www.epa.gov/landfills/municipal-solid-waste-landfills#whatis>. Accessed June 5, 2017.

²⁰⁹ Code of Virginia 10.1-1400

²¹⁰ Code of Virginia 10.1-1400

²¹¹ DC Code 8-901

²¹² DCMR12-K1

²¹³ DCMR 20-40

²¹⁴ DCMR 20-800

²¹⁵ Arlington County Code Chapter 8.1

²¹⁶ Arlington County Code Chapter 10

Relevant State and Local Guidance:

- Asbestos Notification Form, DOEE, Air Quality Division 10²¹⁷
- Asbestos Notification Form ²¹⁸

5.2.3. Hazardous Materials Federal Laws, Regulations, and Other Guidance

The EPA is the Federal agency responsible for overseeing hazardous waste generation, storage, treatment, and disposal. The Hazardous Materials Transportation Act is applicable to the transportation of hazardous materials in commerce, including interstate and intrastate carriers. Hazardous materials in railroad cars can only be shipped by persons registered by the USDOT and the hazardous material must be properly classed, described, packaged, marked, labeled, and in condition for shipment. OSHA also provides regulations related to hazardous waste operations and emergency response to protect workers and help them handle hazardous wastes appropriately.

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- Clean Water Act of 1972 (CWA)²¹⁹
- Clean Air Act of 1970 (CAA)²²⁰
- CERCLA of 1980²²¹
- Spill Prevention, Control and Countermeasure (SPCC) Regulation²²²
- RCRA of 1976²²³
- Hazardous Materials Transportation Act of 1975²²⁴
- OSHA Standard for Hazardous Materials²²⁵
- RCRA and Superfund Amendments and Reauthorization Act of 1986²²⁶

²¹⁷ District Department of Energy and the Environment (DOEE). Undated. Asbestos Notification Form DOEE. Accessed from <https://doee.dc.gov/publication/asbestos-notification-form>. Accessed January 15, 2018.

²¹⁸ Virginia Department of Labor and Industry. Undated. Asbestos Notification Form. Accessed from http://www.doli.virginia.gov/leadasbestos/leadasbestos_forms.html. Accessed January 15, 2018.

²¹⁹ 33 USC 1251

²²⁰ 42 USC 7401

²²¹ 42 USC 9601

²²² 40 CFR 112

²²³ 42 USC 6901 et seq.

²²⁴ 49 USC 5101

²²⁵ 1910 Subpart H. OSHA Standard for Hazardous Materials. Accessed from https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10117. Accessed May 1, 2018.

²²⁶ Public Law 108-201

- EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) Regulations²²⁷
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)²²⁸
- Hazardous and Solid Waste Amendments of 1984²²⁹

Relevant Federal Guidance:

- FRA Operating Practices Compliance Manual (2012)²³⁰

5.2.4. Hazardous Materials State and Local Laws, Regulations, and Other Guidance

The Virginia Voluntary Remediation Program (VRP) and the District of Columbia Department of Energy & Environment (DOEE) Voluntary Cleanup Program (VCP) provide a framework for conducting the cleanup of any brownfield or site contaminated by hazardous substances that is not listed in the EPA National Priority List during property development in the event that the property owner, developer, or other entity did not cause or contribute to the contamination.^{231, 232, 233} In addition, under RCRA and District statutes, the District has the authority to ensure safe and effective hazardous waste management and to establish a program of regulation over the generation, storage, transportation, treatment, and disposal of hazardous waste under District Law 2-64, Code 8-1301 to 8-1322.²³⁴

Relevant State and Local Laws and Regulations:

- Virginia Hazardous Waste Management Regulations²³⁵
- Virginia Aboveground Storage Tank (AST) Regulations²³⁶

²²⁷ 40 CFR 63

²²⁸ 7 USC 136

²²⁹ 42 USC 6924

²³⁰ FRA, Office of Railroad Safety. November 2012. Operation Practices Compliance Manual. <http://www.fra.dot.gov/Elilib/Document/15640>. Accessed June 5, 2017.

²³¹ VDEQ. Undated. Virginia Voluntary Remediation Program. Accessed from <http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RemediationProgram/VoluntaryRemediationProgram.aspx>. Accessed January 15, 2018.

²³² DOEE. Undated. District Voluntary Cleanup Program. Accessed from <https://doee.dc.gov/service/participate-voluntary-cleanup-program>. Accessed January 15, 2018.

²³³ According to the EPA, a brownfield is “a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.” Accessed from <https://www.epa.gov/brownfields/overview-brownfields-program>. Accessed May 3, 2018.

²³⁴ DC Law 2-64

²³⁵ VDEQ. Undated. Virginia Hazardous Waste Management Regulation. Accessed from <http://deq.state.va.us/Portals/0/DEQ/Land/Guidance/dhwfr.pdf>. Accessed January 15, 2018.

²³⁶ VDEQ. Undated. Land Protection Revitalization - Petroleum Program. Accessed from <http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/PetroleumProgram/StorageTanks/AbovegroundStorageTanks.aspx>. Accessed January 15, 2018.

- Virginia Underground Storage Tanks (USTs): Technical Standards and Corrective Action Requirements²³⁷
- Virginia Voluntary Environmental Assessment²³⁸
- Virginia Brownfield Restoration and Land Renewal Act²³⁹
- Underground Storage Tank Management Act of 1990²⁴⁰
- District of Columbia Hazardous Waste Management Act of 1977, as amended²⁴¹
- District of Columbia Brownfields Revitalization Amendment Act of 2010²⁴²
- Pesticide Operations Act of 1977²⁴³

The Arlington County Fire Prevention Code contains hazardous materials permit requirements, spill notification procedures, and hazardous materials handling, storage, and transportation requirements.²⁴⁴

Relevant State and Local Guidance:

- There are no relevant state and local guidance for this resource.

5.3. Study Area

The Local Study Area for solid waste and hazardous materials is the same as the Project Area. The Regional Study Area consists of the public and government land within a 1-mile radius of the Project Area, as shown in **Figure 5-1**. This radius distance was selected as it is generally consistent with the recommended search distance for standard environmental record sources provided in American Society for Testing and Materials (ASTM) 1527-13 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.

²³⁷ Virginia UST Regulations. Accessed from <https://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC25-580>. Accessed January 15, 2018.

²³⁸ Code of Virginia 10.1

²³⁹ Code of Virginia 10.1

²⁴⁰ DC Code 8-1301

²⁴¹ DOEE. Undated. District of Columbia Hazardous Waste Management Laws. Accessed from <https://doee.dc.gov/publication/hazardous-waste-management-laws-regulations>. Accessed January 15, 2018.

²⁴² DC Code 8-631

²⁴³ DOEE. Undated. District of Columbia Pesticide Operations Act of 1977. Accessed from <https://doee.dc.gov/service/pesticides-laws-and-regulations>. Accessed January 15, 2018.

²⁴⁴ Arlington County Code Chapter 8.1

Figure 5-1 | Study Areas for Solid Waste and Hazardous Materials



The Regional Study Area is sufficient in size to:

- Capture the proposed Project elements detailed in the alternatives, which would include all aspects of construction;
- Evaluate related resources (for example, waterbodies that supply drinking water, critical habitats for endangered species, and high-density residential areas);
- Evaluate adjacent land uses to the Project or alternative footprint and construction areas, and identify land uses that could be particularly sensitive to impacts from solid wastes; and
- Identify regional disposal facilities where solid waste (including hazardous waste) generated within the Project Area will be disposed of.

5.4. Methodology

The following sections describe the methodologies undertaken to analyze the affected environment for solid waste and hazardous materials.

5.4.1. Solid Waste

The analysis for solid waste was based on a review of available reports and data (for example, Federal and state statutes; and resource agency, local, and regional agency policies and ordinances), GIS databases, maps, reports, modeling, and professional judgment. Data sources included:

- National Priorities List (NPL)²⁴⁵
- EPA Cleanups in My Community online GIS tool²⁴⁶
- RCRA Corrective Actions (CORRACTS)²⁴⁷
- RCRA Treatment, Storage, and Disposal Facilities (TSDFs)
- Site-specific topographic maps and hydrologic features maps for groundwater flow directions

5.4.2. Hazardous Materials

The 2016 Environmental Data Collection Report for the Project identified 24 registered tanks, three EPA Toxic Release Inventory (TRI) facilities, and three voluntary remediation sites within the a 500-foot radius of the Local Study Area. The standard environmental record sources provided in ASTM 1527-13 were searched in proximity to the Local Study Area using the approximate minimum search distances (up to 1 mile for certain databases). From this research, off-site releases or hazardous materials-related

²⁴⁵ EPA. Undated. National Priorities List (NPL) Sites – by State. Accessed from <https://www.epa.gov/superfund/national-priorities-list-npl-sites-state>. Accessed May 2, 2018.

²⁴⁶ EPA. Undated. Cleanups in My Community Map. Accessed from <https://ofmpub.epa.gov/apex/cimc/f?p=cimc:73::::71>. Accessed May 3, 2018.

²⁴⁷ EPA. Undated. Corrective Action Sites Around the Nation. Accessed from <https://www.epa.gov/hwcorrectiveactionsites>. Accessed May 3, 2018.

listings with the potential to impact the Local Study Area within this search radius were identified. Other data sources included:

- EPA Enviromapper²⁴⁸
- VDEQ Environmental GIS (VEGIS)²⁴⁹
- DC Atlas Plus²⁵⁰
- VDEQ Voluntary Remediation Program (VRP)²⁵¹
- DOEE Voluntary Cleanup Program (VCP)²⁵²
- TRI²⁵³
- Applicable Federal and state general plans and regulations
- Federal, state, and local GIS databases

5.5. Affected Environment

The following sections describe the affected environment for both solid waste and hazardous materials.

5.5.1. Solid Waste

Due to the current use of the Local Study Area as an active railroad right-of-way, there is currently no solid waste generated or stored within the Local Study Area. Based on a review of the environmental record sources, there were also no solid waste facilities or landfills identified within the Local Study Area. The closest permitted solid waste facility is the Pentagon solid waste incinerator located at 425 Old Jefferson Davis Highway in Arlington, Virginia, located approximately 1,000 feet northwest of the Local Study Area, which is not expected to impact the Local Study Area.

²⁴⁸ EPA. Undated. Enviromapper for Envirofacts. Accessed from <https://www.epa.gov/emefdata/em4ef.home>. Accessed April 30, 2018.

²⁴⁹ VDEQ. Undated. VEGIS. Accessed from <http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx>. Accessed April 30, 2018.

²⁵⁰ District of Columbia. Undated. DC Atlas Plus. Accessed from <http://atlasplus.dcgis.dc.gov/>. Accessed April 30, 2018.

²⁵¹ VDEQ. Undated. Land Protection Revitalization - Voluntary Remediation Program. Accessed from <http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RemediationProgram/VoluntaryRemediationProgram.aspx>. Accessed January 15, 2018.

²⁵² DOEE. Undated. District Voluntary Cleanup Program. Accessed from <https://doee.dc.gov/service/participate-voluntary-cleanup-program>. Accessed January 15, 2018.

²⁵³ EPA. Undated. Toxics Release Inventory Program. Accessed from <https://www.epa.gov/toxics-release-inventory-tri-program>. Accessed April 30, 2018.

5.5.2. Hazardous Materials

Sensitive Areas

The Regional Study Area is within the Potomac River watershed. According to the District Atlas online database, no additional sensitive receptors such as daycare facilities, hospitals, or places of worship were noted on or adjacent to the Local Study Area.

Database Search Report

A database report obtained from a third party on November 14, 2017, was reviewed for evidence of hazardous materials releases and the storage of hazardous materials within the Local and Regional Study Areas. A summary of the available and reasonably ascertainable information from standard environmental record sources is provided in **Table 5-1** and **Table 5-2**. According to the database report, no releases of oil and hazardous material or generators of hazardous waste were identified within the Local Study Area; however, several nearby properties were identified within the Regional Study Area.

Table 5-1 | Federal Environmental Records within the Regional and Local Study Areas

Record Source	Search Radii from Center of Project Area	Number of Sites within Search Distance	Project Area Listed?
National Priorities List (NPL) Sites	1.0 mile	0	No
Superfund Enterprise Management System (SEMS) Sites	0.5 miles	2	No
Comprehensive Emergency Response, Compensation, and Liability Information System (CERCLIS) Sites	0.5 miles	2	No
CERCLIS No Further Remedial Action Planned (NFRAP) Sites	Property and Abutting	2	No
RCRA Corrective Action (CORRACT) Sites	1.0 mile	0	No
RCRA Non-CORRACTS Treated, Stored, and Disposed of hazardous waste (TSD) Sites	0.5 miles	0	No
RCRA Generators	0.25 miles	27	No
RCRA NonGen (No Longer Generating)	0.25 miles	12	No
Engineering and Institutional Control Sites	Property and Abutting	0	No
Federal Emergency Release Notification System (ERNS)	Property	4	No
Federal Facility Index System (FINDS)	Property	7	No

Source: ERIS Database Report November 14, 2017

Table 5-2 | Local Environmental Records within the Study Area

Record Source	Search Radii from Project Area	Number of Sites within Search Distance	Project Area Listed?
Solid Waste Disposal Sites	0.5 miles	0	No
Leaking Storage Tank Sites	0.5 miles	21	No
Registered Storage Tank Sites	Property & Abutting	32	No
Voluntary Cleanup Sites	0.5 miles	0	No
Brownfield Sites	0.5 miles	0	No

Source: *ERIS Database Report November 14, 2017*

Based on the initial database results summarized in **Table 5-1** and **Table 5-2**, certain sites identified within the Regional Study Area were further reviewed using state and Federal databases to determine whether the sites may be located within or near to the Local Study Area. Information obtained during these reviews are summarized in **Table 5-3**.

Table 5-3 | Nearby Properties of Concern

Property Name	Address and Distance to Project Area	Description
SEI – Arlington Acquisition Corp. Site	399 Old Jefferson Davis Highway, Arlington, VA Abuts Project Area to North	<ul style="list-style-type: none"> The property is listed in the Institutional Control and Voluntary Remediation Program (VRP) databases for the existing lead and arsenic impacts to soil and groundwater as of September 1995. The property is listed in the Spills database for the identification of petroleum impacted soils in June 2002.
Long Bridge Park	475, 333, & 355 Long Bridge Drive, Arlington, VA Abuts Project Area to West	<ul style="list-style-type: none"> The property is listed in the Virginia Voluntary Remediation Program (VRP) database due to active remedial monitoring at the property.
RF and P Scrapyard – Davis Industries	400 Old Jefferson Davis Highway, Arlington, VA Abuts Project Area to North	<ul style="list-style-type: none"> Several releases of petroleum occurred from underground storage tanks (USTs) at the property in October 1988, January 1990, and April 1991. The releases are listed as closed.
Davis Industries Site	311 Sixth Street South, Arlington, VA Abuts Project Area to North	<ul style="list-style-type: none"> The property was listed in the Institutional Control, CERCLIS, SEMS Archive, National Priorities List (NPL), CERCLIS NFRAP, Polychlorinated Biphenyl (PCB), and VRP databases for the property's former listing as a EPA Superfund Site due to impacts associated with former scrap metal recycling operations. The property is currently listed as No Further Action Required.

Property Name	Address and Distance to Project Area	Description
Exxon Service Station #25644	355 Old Jefferson Davis Highway, Arlington VA 200 Feet West of Project Area	<ul style="list-style-type: none"> Three releases of petroleum occurred from leaking USTs at the property in May 1990, July 1990, and January 1986. The releases were listed as closed. The property is listed as a RCRA-Conditionally Exempt Small Quantity Generator (CESQG) CESQG for the generation of wastes associated with automotive repair operations. Four former USTs were located on the property: including one 8,000-gallon gasoline UST, two 10,000-gallon gasoline USTs, and one 1,000-gallon used oil UST removed in May 1994.
Potomac River	900 Ohio Drive SW, Washington, DC Abuts Project Area to North/South	<ul style="list-style-type: none"> Two releases of an unknown oil impacted water within the Potomac River in 1994 and 1996 and were listed in the ERNS database. The releases are listed as closed. The property is listed in the UST database for the listing of seven USTs at the property. Five of the USTs are listed as Permanently Out of Use, while one 6,000-gallon gasoline UST and one 2,000-gallon diesel UST are currently in use.
NPS East Potomac Transit Storage Facility and Maintenance Yard	1000 Ohio Drive SW, Washington, DC Abuts Project Area to East	<ul style="list-style-type: none"> The property is listed in the Leaking Underground Storage Tank (LUST) database for a total of seven releases of either gasoline or diesel which impacted soil and groundwater at the property. All releases were listed as closed and no additional information was obtained. The property is listed in the RCRA-CESQG and RCRA NonGen databases for the generation of halogenated solvents. The property is listed in the UST database for five former gasoline, waste oil, and diesel USTs and one 10,000-gallon gasoline UST and one 6,000-gallon gasoline UST currently in use.
Portal Hotel	1330 Maryland Avenue SW, Washington, DC 50 Feet South of Project Area	<ul style="list-style-type: none"> A release of heating oil, gasoline, and diesel impact soil at the property in June 1999. Releases of gasoline and heating oil impacted soil and groundwater from two USTs in June 2002 and June 2003. All three LUSTs are listed as closed. The property is listed in the FINDS and RCRA-CESQG databases for the generation of halogenated solvents. One UST is listed as permanently out of use.

Property Name	Address and Distance to Project Area	Description
CVS Pharmacy	1201 Maryland Avenue SW, Washington, DC 70 Feet North of Project Area	<ul style="list-style-type: none"> The property is listed in the FINDs, RCRA-CESQG, and RCRA-Large Quantity Generator (LQG) databases for the generation of pharmaceutical waste such as mercury, silver, and benzenes.
Washington Marina	445 12 th Street SW, Washington, DC Abuts Project Area to South	<ul style="list-style-type: none"> A sheen was observed in the Potomac River in 2000 and 2005 and were listed in the ERNs database. The releases were listed as closed. The property is listed in the FINDs, RCRA-CESQG, and RCRA NonGen databases for the generation of mercury, nonhalogenated solvents, and ignitable wastes.
Potomac Center North	500 12 th Street SW Washington, DC Abuts Project Area to South	<ul style="list-style-type: none"> The property is listed in the RCRA-CESQG and FINDs databases for the generation of mercury, ignitable, and corrosive waste.
901 D Street	901 D Street SW Washington, DC Abuts Project Area to South	<ul style="list-style-type: none"> The property is listed in the Hazardous Materials Information Reporting System (HMIRS) for the release of diesel fuel from a leaking fuel tank. The release was adequately remediated and listed as closed. The property is listed in the RCRA-CESQG database for the generation of mercury, ignitable and corrosive wastes.
Exxon	970 D Street SW Washington, DC 130 Feet South of Project Area	<ul style="list-style-type: none"> A release of gasoline occurred from LUST and impacted soil at the property in February 1989. The release is listed as closed. The property is listed in the RCRA NonGen database for former generation of benzene, ignitable waste, and methyl ethyl ketone. The property is listed in the UST database for eight former gasoline USTs and two former waste oil and used oil UST.

Source: *ERIS Database Report November 14, 2017*

Historical Record Sources

Historical documentation, including historical aerial photographs, historical topographic, and Sanborn fire insurance maps, were reviewed for properties or concerns that have the potential to impact the Local Study Area.

Sanborn Fire Insurance Maps

Sanborn maps are a uniform series of large-scale detailed maps dating back to 1867 that depict the commercial, industrial, and residential sections of cities. These maps historically assisted fire insurance agents in determining the degree of hazard associated with a particular property. Sanborn maps are currently used to track the changing landscape and property uses. **Table 5-4** provides a summary of the Sanborn maps relevant to the Project.

Table 5-4 | Summary of Sanborn Fire Insurance Maps

Year(s)	Descriptions
1888	The Local Study Area is occupied by railroad lines along Maryland Avenue SW in the District. The Baltimore and Potomac Railroad Freight Station abuts the Local Study Area to the south. The surrounding area is primarily residential and commercial in nature. No map coverage is available for the southwestern portion of the Local Study Area.
1903	A railroad switching yard is noted south of the Project Area at the intersection of Maryland Avenue SW and 12 th Street SW in the District. No map coverage is available for the southwestern portion of the Local Study Area.
1928, 1959	The previously depicted Baltimore and Potomac Railroad Freight Station is now developed with a railroad freight warehouse. An industrial business is noted north of the Local Study Area along 14 th Street SW in the District. No coverage is available for the southwestern portion of the Local Study Area.
1984	The previously depicted railroad freight warehouse is no longer shown. The Potomac Electrical Power Company is noted south of the Local Study Area. The surrounding area is primarily government buildings. No coverage is available for the southwestern portion of the Local Study Area.

Source: ERIIS Database Report November 14, 2017

Historical Aerial Photographs

Aerial photographs were obtained from a third party for the Project and reviewed. The Local Study Area has been historically occupied by railroad tracks as shown in the earliest aerial photograph dating back to 1949. The northern portion of the Project is surrounded by commercial and industrial properties in addition to a railroad switching yard from at least 1949 until 1960. A bridge was constructed west of the Local Study Area in 1951. I-395 was constructed east of the Local Study Area in 1963. No additional features or evidence of environmental concerns were noted from the aerial photographs.

Historical Topographic Maps

Historical U.S. Geological Survey (USGS) topographic maps showing the Local Study Area for the years 1900, 1945, 1951, 1956, 1965, 1971, 1972, 1979, 1980, 1983, 2013, and 2014 were obtained and reviewed. A railroad switching yard was north of the Local Study Area from at least 1945 until 1956. No additional notable features were shown on the topographic maps.

5.5.3. Findings

Based on a review of available records, there are currently no on-site permitted solid waste facilities located within the Regional or Local Study Areas with the potential to impact the Project.

Potential sites located within the Regional Study Area and near the Local Study Area that may be impacted by hazardous and contaminated materials are summarized below.

Environmental Listings Identified at Nearby Properties

Although there are currently no environmental listings within the Local Study Area, as summarized in **Table 5-3**, there are several nearby environmental listings within the Regional Study Area that may have the potential to impact the Local Study Area including three VRP listings near the Long Bridge Park area, one CERCLIS NFRAP site, as well as several LUSTs and Federally-listed generators of hazardous waste. Additional testing would be required to determine whether these nearby properties have impacted soils or groundwater within the Local Study Area.

Active Railroad Right-of-Way within the Project Area

According to historical sources, railroad tracks have been located on the Local Study Area since at least 1875.²⁵⁴ Although not specifically identified in the third-party database report, railroad rights-of-way are often impacted with residual oil and hazardous materials, including metals, pesticides, and petroleum constituents such as polycyclic aromatic hydrocarbons (PAHs). Railroad-related sources of oil and hazardous materials (OHM) may include creosote- or arsenic-laced railroad ties, herbicides, lubricating oils, diesel fuel, and diesel exhaust. Fill of unknown origin used to bring tracks to grade may contain debris, coal, coal ash, coal slag, or other potential contaminants. Additional testing would be required to determine whether these nearby properties have impacted soils or groundwater within the Local Study Area.

Former Railroad Station and Railroad Switching Yard Adjacent to the Local Study Area

The Baltimore and Potomac Freight Station and a railroad switching yard formerly abutted the Local Study Area on the south and north, respectively. Similar to railroad rights-of-way, railroad stations and switching yards have the potential for elevated contamination levels due to the more frequent or intense use of pesticides to improve sight lines and a greater intensity of train activity. Railroad switching yards also have a higher potential for accidents involving hazardous cargoes as well as hazardous materials emanating from equipment cleaning areas, fueling areas, and maintenance and repair activities. Additional testing would be required to determine whether this nearby property has impacted soils or groundwater within the Local Study Area.

²⁵⁴ General Railroad Right of Way Act of 1875. Accessed from <https://www.loc.gov/law/help/statutes-at-large/43rd-congress/session-2/c43s2ch152.pdf>. Accessed March 19, 2018.

6.0 Transportation

6.1. Overview

This section documents the existing transportation system in the Long Bridge Study Area. This assessment includes all transportation modes, including passenger and freight railroad (Amtrak, Virginia Railway Express [VRE], CSX Transportation [CSXT], and Norfolk Southern [NS]), the transit system (Metrorail and local bus operations), the pedestrian and bicycle network, the surrounding roadway network, and the marine transportation system.

This section includes a definition of the Study Area, as well as the methodology used to identify and assess existing transportation conditions within the Study Area. Federal regulations define navigable waterways as “waters that are subject to the ebb and flow of the tide and are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.”²⁵⁵ In addition, there is a Federal channel within the Study Area and any proposed alterations of a U.S. Army Corps of Engineers (USACE) Federally authorized civil works project must be approved by the USACE.²⁵⁶

6.2. Regulatory Context and Guidance

The following laws, regulations, and agency jurisdiction and management guidance are pertinent to transportation resources. Key regulations and guidance that are most relevant to the Long Bridge Project are listed below.

Major modes of transportation in this assessment have a primary Federal agency responsible for the development, evaluation, and environmental review specific to that mode. These Federal agencies fall under the U.S. Department of Transportation (USDOT), which is responsible for transportation across the U.S. These Federal agencies include the:

- Federal Railroad Administration (FRA), which has regulatory oversight over passenger (intercity and commuter) and freight railroad services (infrastructure, operations and equipment);
- Federal Transit Administration (FTA), which manages transportation funding for the various state and local transit agencies (including commuter railroads);
- Federal Highway Administration (FHWA), which manages highways, bridges, and tunnels and provides research and technical assistance to transportation agencies;
- United States Coast Guard (USCG), which oversees navigable waterways;²⁵⁷
- Federal Aviation Administration (FAA), which regulates the travel of people and goods through the air;

²⁵⁵ 33 CFR 329

²⁵⁶ 33 USC 408

²⁵⁷ USCG. 2014. Memorandum of Understanding between the U.S. Coast Guard, the Federal Highway Administration, the Federal Transit Administration, and the Federal Railroad Administration to Coordinate and Improve Bridge Planning and Permitting.

- USACE, which regulates the Federal navigation channel; and
- National Park Service (NPS), which controls certain roadways within the Study Area. NPS also has applicable regulations for this review.

6.2.1. Transportation Federal Laws, Regulations, and Other Guidance

The FRA Procedures for Considering Environmental Impacts require that an Environmental Impact Statement (EIS) evaluate “impacts on transportation: of both passengers and freight; by all modes, including the bicycle and pedestrian modes; in local, regional, national, and international perspectives; and including impacts on traffic congestion.”²⁵⁸ As mentioned previously, NPS also has regulations pertaining to transportation within national parks. The Washington Metropolitan Area Transit Authority (WMATA) also provides guidance on transit services for the region.

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- Section 9 of the Rivers and Harbors Act of 1899^{259,260}
- Section 14 of the River and Harbors Act of 1899²⁶¹
- General Bridge Act of 1906²⁶²
- Regulations for Drawbridges²⁶³
- Truman-Hobbs Act²⁶⁴
- General Bridge Act of 1946²⁶⁵
- International Bridge Act of 1972²⁶⁶
- USCG Aids to Navigation^{267,268}
- NPS Regulations^{269,270}

²⁵⁸ 64 FR 28545

²⁵⁹ 33 USC 403

²⁶⁰ 33 CFR 321

²⁶¹ 33 USC 408

²⁶² 33 USC 491-498

²⁶³ 33 USC 499

²⁶⁴ 33 USC 511-524

²⁶⁵ 33 USC 525-533

²⁶⁶ 33 USC 535-535i

²⁶⁷ 14 USC 81

²⁶⁸ 14 USC 85

²⁶⁹ 36 CFR 4

²⁷⁰ 36 CFR 5

- Act of April 25, 1808, ch 15 Stat. 1. An Act authorizing the erection of a bridge over the river Potomac within the District of Columbia²⁷¹
- Act of June 21, 1870, ch 141, 142 Stat. 1. An Act supplementary to an Act entitled “An Act to authorize the Construction, Extension (Extension, Construction) and Use of a lateral Branch of the Baltimore and Potomac Railroad Company into and within the District of Columbia,” approved February 5, 1870.²⁷²
- 1901, An Act To provide for eliminating certain grade crossings on the line of the Baltimore and Potomac Railroad Company, in the city of Washington, District of Columbia, and requiring said company to depress and elevate its tracks and to enable it to relocate parts of its railroad therein, and for other purposes. Fifty-Sixth Congress Session II, Chapter 353²⁷³
- Act of February 12, 1901, Ch 353 Stat. 1. Federal and Local Legislation Relating to Canals and Steam Railroads in the District of Columbia²⁷⁴

Relevant Federal Guidance:

- NPS Management Policies 2006, Section 9.2 (Transportation Systems and Alternative Transportation)²⁷⁵

²⁷¹ Tenth Congress, Session I, Chapter 15. An Act authorizing the erection of a bridge over the river Potomac within the District of Columbia. Accessed from <https://www.loc.gov/law/help/statutes-at-large/10th-congress/c10.pdf>. Accessed October 23, 2017.

²⁷² 1870, An Act supplementary to an Act entitled “An Act to authorize the Construction, Extension (Extension, Construction) and Use of a lateral Branch of the Baltimore and Potomac Railroad Company into and within the District of Columbia”. <https://www.loc.gov/law/help/statutes-at-large/41st-congress/session-2/c41s2ch142.pdf>. Accessed October 23, 2017.

²⁷³ 1901, An Act To provide for eliminating certain grade crossings on the line of the Baltimore and Potomac Railroad Company, in the city of Washington, District of Columbia, and requiring said company to depress and elevate its tracks and to enable it to relocate parts of its railroad therein, and for other purposes. Fifty-sixth Congress Session II, Chapter 353. Accessed from <https://www.loc.gov/law/help/statutes-at-large/56th-congress/session-2/c56s2ch353.pdf>. Accessed October 23, 2017.

²⁷⁴ U.S. Government Printing Office. 1903. Federal and Local Legislation Relating to Canals and Steam Railroads in the District of Columbia, 1802—1903. Accessed from <https://play.google.com/books/reader?id=vEkEAAAAMAAJ&printsec=frontcover&output=reader&hl=en&pg=GBS.PA3>. Accessed October 23, 2017.

²⁷⁵ National Park Service (NPS). 2006. Management Policies. Accessed from https://www.nps.gov/training/nrs/references/references_policies.html. Accessed January 15, 2018.

6.2.2. Transportation State and Local Laws, Regulations, and Other Guidance

Relevant State and Local Laws and Regulations:

- Arlington County Code, Title 22, Street Development and Construction²⁷⁶

Relevant State and Local Guidance:

- Virginia Department of Rail and Public Transportation (DRPT) Virginia State Rail Plan²⁷⁷
- Virginia Department of Transportation (VDOT) Traffic Engineering Design Manual²⁷⁸
- District Department of Transportation (DDOT) Design and Engineering Manual²⁷⁹
- DDOT State Rail Plan²⁸⁰
- DDOT Pedestrian Safety and Work Zone Standards – Covered and Open Walkways²⁸¹
- DDOT Public Realm Manual²⁸²
- DDOT DC Temporary Traffic Control Manual²⁸³
- DDOT Comprehensive Transportation Review Guidelines²⁸⁴
- WMATA Compact²⁸⁵

²⁷⁶ Arlington County Code Chapter 22

²⁷⁷ Virginia Department of Rail and Public Transportation (DRPT). 2017. Virginia State Rail Plan. Accessed from <http://www.drpt.virginia.gov/rail/reference-materials/virginia-state-rail-plan>. Accessed January 10, 2018.

²⁷⁸ Virginia Department of Transportation (VDOT). 2014. Traffic Engineering Design Manual. Accessed from http://www.virginiadot.org/business/resources/LocDes/VDOT_Traffic_Engineering_Design_Manual/TEDM_TOC.pdf. Accessed June 19, 2017.

²⁷⁹ District Department of Transportation (DDOT). 2009. Design and Engineering Manual. https://ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/ddot_design_and_engineering_manual_04-2009.pdf. Accessed June 6, 2017.

²⁸⁰ DDOT. 2017. District of Columbia State Rail Plan. Accessed from https://ddot.dc.gov/sites/default/files/dc/sites/ddot/page_content/attachments/DC%20SRP%20FinalReport.pdf. Accessed January 10, 2018.

²⁸¹ DDOT. 2007. Pedestrian Safety and Work Zone Standards – Covered and Open Walkways. Accessed from https://dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/pedestrian_safety_and_work_zone_standards_covered_and_open_walkways_july_2010.pdf. Accessed June 6, 2017.

²⁸² DDOT. 2011. Public Realm Manual. Accessed from https://ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/ddot_public_realm_design_manual_2011.pdf. Accessed June 6, 2017.

²⁸³ DDOT. 2006. DC Temporary Traffic Control Manual – Guidelines and Standards. Accessed from <https://comp.ddot.dc.gov/Documents/Temporary%20Traffic%20Control%20Manual.pdf>. Accessed June 6, 2017.

²⁸⁴ DDOT. 2012. DDOT Guidelines for Comprehensive Transportation Review (CTR) Requirements. Accessed from https://ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/ddot_comprehensive_transportation_review_requirements_2012.pdf. Accessed June 6, 2017.

²⁸⁵ Washington Metropolitan Area Transit Authority (WMATA). 2009. WMATA Compact. Accessed from https://www.wmata.com/about/board/upload/Compact_Annotated_2009_final.pdf. Accessed March 16, 2018.

Metropolitan Planning Organizations (MPOs) are Federally mandated organizations comprised of government and local officials that set transportation priorities. The local MPO in the Local and Regional Study Areas is the Metropolitan Washington Council of Governments (MWCOG).

- MWCOG Financially Constrained Long-Range Transportation Plan (CLRP)²⁸⁶

6.3. Study Area

The Local and Regional Study Areas for the transportation network are sufficient to assess potential physical impacts to roads, railroad and transit lines, and trails in proximity to the proposed alternatives, as well as potential operational impacts. These impacts will be considered both for the long term and during construction.

The Project Area includes the tracks, signals, bridges, and related railroad infrastructure being modified by the Project. This area runs along the railroad right-of-way owned by CSXT from the RO Interlocking in Arlington, Virginia, to the L'Enfant (LE) Interlocking in southwest Washington, DC.²⁸⁷

As shown in **Figure 6-1**, the Local Study Area encompasses 0.25 miles immediately adjacent to the construction footprint, and includes the Project Area. It includes the tracks, signals, bridges, and related railroad infrastructure being modified by the Project as described above. In addition, it also includes roads, intersections, trails, sidewalks, and waterways that could be impacted by the construction activities of the Project. The 0.25-mile Local Study Area applies to both land-based and water-based transportation. For the purposes of evaluating boat traffic, marinas outside the Study Area are also identified.

The Regional Study Area includes the jurisdictions covered within the MWCOG CLRP as shown in **Figure 6-3**.

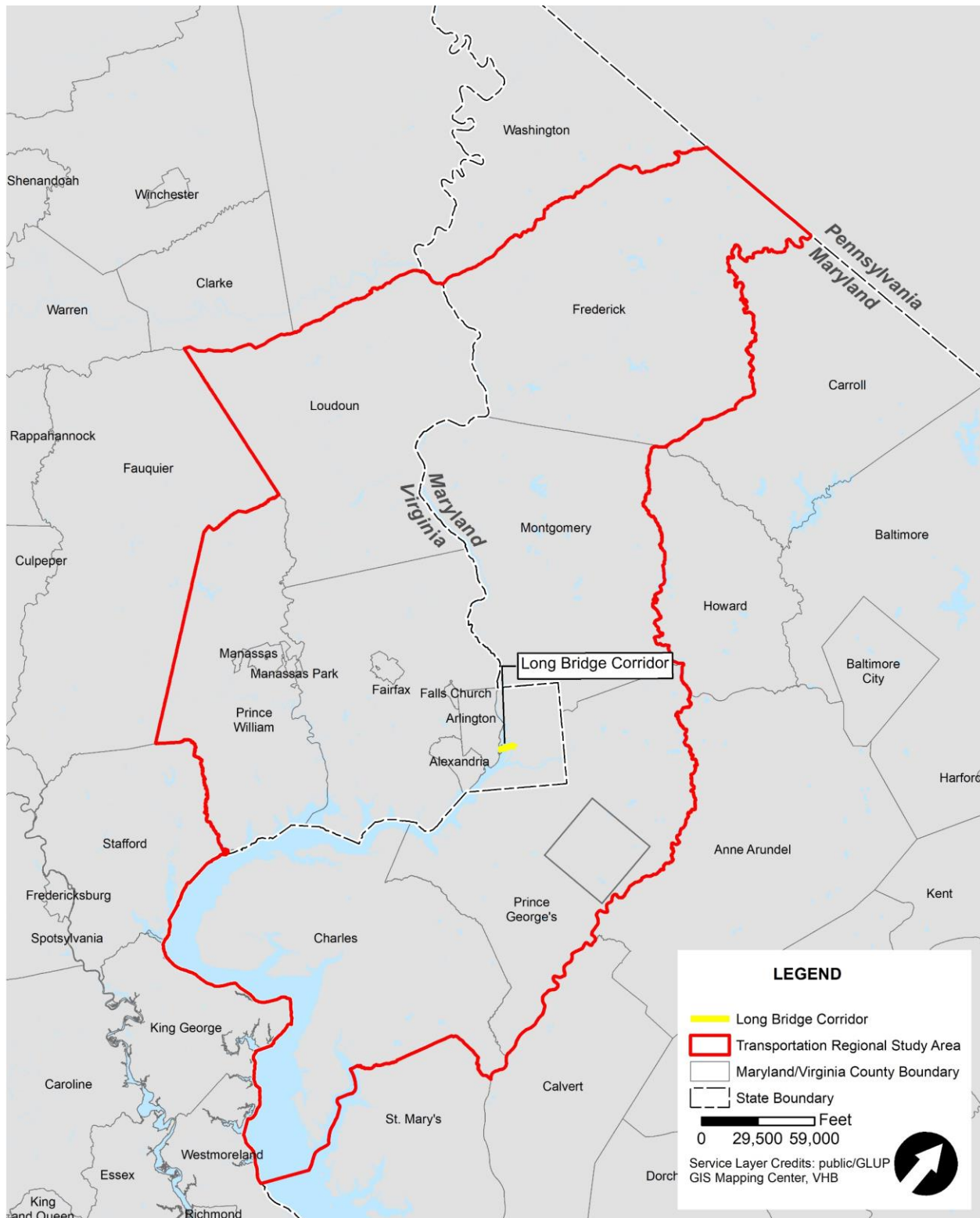
²⁸⁶ DDOT. 2016. Financially Constrained Long-Range Transportation Plan (CLRP) for the National Capital Region. Accessed from <http://www1.mwcog.org/clrp/resources/2016/2016AmendmentReport.pdf>. Accessed January 10, 2018.

²⁸⁷ Note that "RO" is the proper name of this interlocking. It is not an acronym.

Figure 6-1 | Local Study Area for Transportation



Figure 6-2 | Regional Study Area for Transportation



6.4. Methodology

This section identifies current transportation facilities and services based on Geographic Information Systems (GIS) data, field reviews, and transportation plans. The transportation analysis addresses the various modes of travel within the study and how those modes affect the surrounding road network, sidewalks, bike system, transit system, and railroad. A summary describing the existing resource conditions and areas of importance within the study area was developed using the data sources listed in **Section 6.5**. This section:

- Documents the existing railroad infrastructure and operations, identifying different services and the number of trains;
- Documents the existing roadway network, highlighting important transportation corridors;
- Identifies current on-street parking areas within the Local Study Area, and the type of parking provided (for example, metered, time-restricted, no parking);
- Documents the existing pedestrian and bicycle facilities, including sidewalks, crosswalks, bike lanes, bike routes, cycle tracks, bikeshare locations, and trails;
- Identifies and documents the existing transit routes, including both infrastructure (stations, stops, tracks, etc.) and operations;
- Documents existing commercial and recreational marine activity; and
- Documents established local, MPO, and regional transportation policies, goals, and objectives.

Navigational conditions within the Local Study Area are delineated graphically using the USACE survey and mapping that define the Federal channel limits, existing depths, and design depths. Additional information was added to the condition map regarding nearby navigational obstructions including current bridge clearances, both horizontal and vertical, published on National Oceanic and Atmospheric Administration (NOAA) nautical chart 12289. Other details that were considered include river currents, flood levels, and normal tide fluctuations.

6.5. Affected Environment

The data necessary to understand existing railroad operations were collected from CSXT, Amtrak, VRE, DRPT, and DDOT. Data sources include:

- Existing capacity of the Long Bridge (incorporating current passenger railroad, commuter railroad, and freight railroad traffic)
- Train control and signaling systems present in the Local Study Area
- Current station dwell times within the Regional Study Area
- Current service stopping patterns
- Passenger loading levels during the peak hour of service
- Any operational issues within the Regional Study Area

To understand broader transportation operations, data were collected and evaluated related to the surrounding transportation network, including roadway operations, bus operations and infrastructure, and trail usage. This analysis was developed through a review of available reports (for example, long-range transportation plans, state railroad plans, and system plans), GIS databases, maps, historical data, and professional judgment. Data sources include:

- Arlington County GIS Data
- District of Columbia GIS Data
- NPS GIS Data
- DDOT daily bicycle counts
- NPS daily bicycle counts
- Arlington County daily bicycle counts
- DDOT vehicle counts (average annual daily traffic [AADT] for 2017)
- Arlington County vehicle counts (AADT for 2017)
- USCG navigable waterway data
- Railroad schedules (Amtrak, VRE, CSXT, Norfolk Southern, and Maryland Area Regional Commuter [MARC])

As noted in **Section 6.4**, the navigation analysis was based on a review of available surveys and charts, including NOAA nautical chart 12289, USACE hydrographic survey, and other relevant data or surveys.

An understanding of the type of vessels that navigate this portion of the river and the frequency of use is important in evaluating the level of impacts on navigation. This information was gathered through discussions with local waterway law enforcement officials, including the USCG and District of Columbia Harbor Patrol officials that patrol these waters.

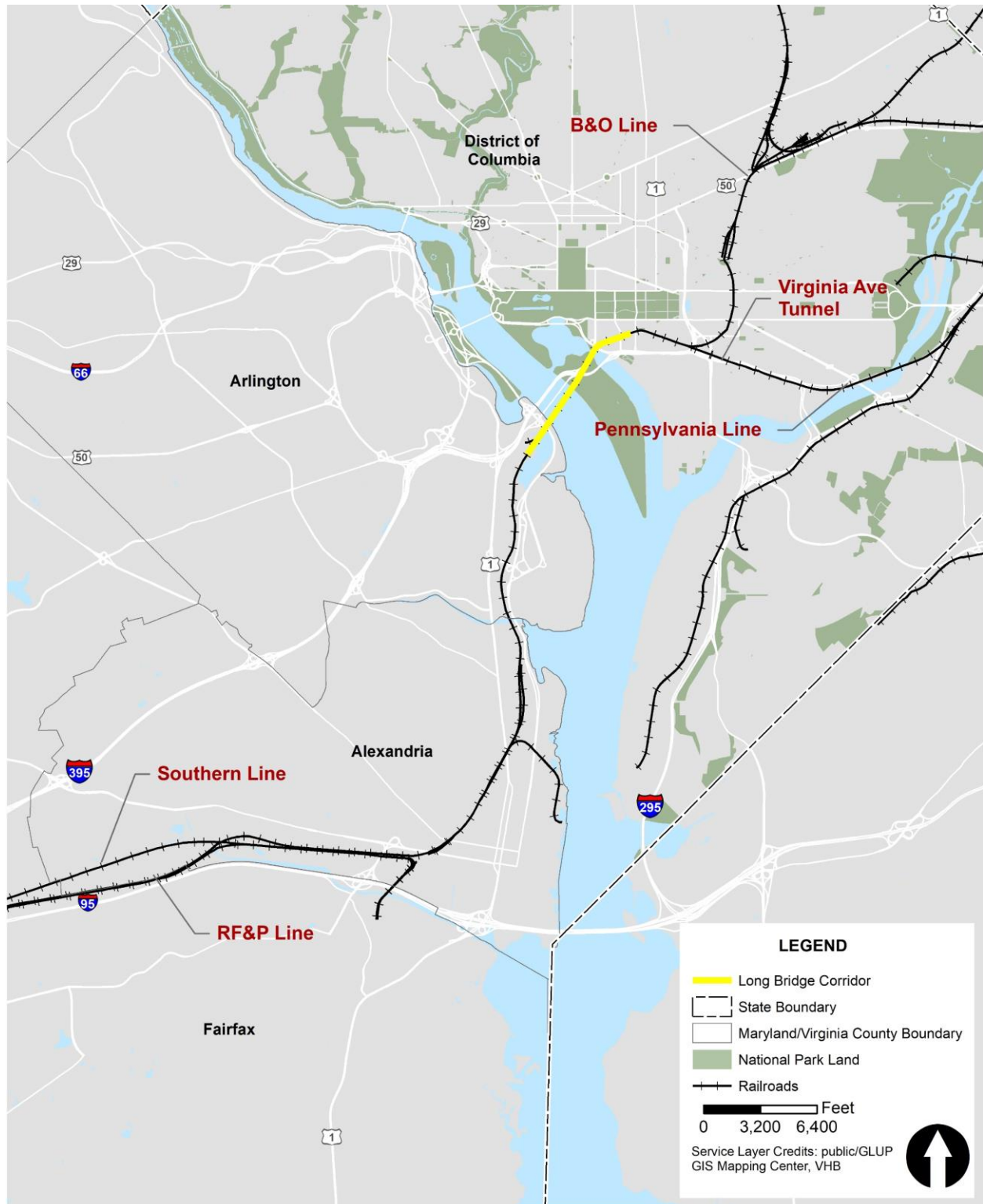
The Long Bridge Study Area is part of one of the busiest multimodal transportation corridors in the Washington, DC, region. The Study Area features a wide range of transportation facilities that accommodate freight service and an array of travel modes, including passenger vehicles, railroad transit, bus transit, bicycles, and pedestrians.

6.5.1. Railroad Infrastructure and Operations

CSXT Freight Service

CSXT, a large freight network serving the eastern U.S., operates a complex railroad network with freight trains moving general merchandise, intermodal containers and trailers, coal, automobiles, and many other commodities. Most of the freight trains that use Long Bridge operate between CSXT's Benning Yard in the District and Acca Yard in Richmond, Virginia. Trains operating between these two points use the CSXT mainline, including the Virginia Avenue Tunnel north of Long Bridge and the Richmond, Fredericksburg, and Potomac (RF&P) Line, shared with VRE's Fredericksburg Line, south of Alexandria, Virginia. **Figure 6-3** depicts the freight and railroad passenger tracks near the Study Area.

Figure 6-3 | Freight and Railroad Passenger Tracks Near the Study Area



All CSXT freight trains use diesel locomotives. An average of 18 CSXT trains per day operate over Long Bridge. Of these, typically two are coal trains, six are single-stacked intermodal, and 10 are general merchandise freight trains. On average, coal trains are estimated to weigh 15,000 tons fully loaded and are 6,000 feet long. Average intermodal and merchandise trains are estimated to be 7,300 feet long and weigh from 3,400 to 7,000 tons.

Norfolk Southern Freight Service

Although NS retains trackage rights across the CSXT-owned Long Bridge, it does not presently operate any freight trains over the bridge. NS operates local trains as far north as Alexandria, Virginia. NS through “road freight” trains cross the Potomac River 75 miles upriver of Long Bridge at Shepherdstown, West Virginia.

Amtrak Passenger Service

Twelve Amtrak trains operate through the Study Area on a typical day in each direction. Of these, six are extensions of regional trips operating on the Northeast Corridor between New York and the District. One regional trip in each direction uses the NS (VRE Manassas) Line to Lynchburg, Virginia, and five trips per direction use the CSXT RF&P Line (VRE Fredericksburg) Line to Richmond, Newport News, and Norfolk, Virginia. The remaining six trains per direction are long-distance services: the Crescent (New Orleans) and Cardinal (Chicago via Charleston, West Virginia) on the NS (VRE Manassas) Line, and the Carolinian (Charlotte, North Carolina), Palmetto (Savannah, Georgia), Silver Meteor (Miami, Florida, via Charleston, South Carolina), and Silver Star (Miami, Florida, via Raleigh, North Carolina) on the CSXT RF&P (VRE Fredericksburg) Line. Amtrak service through the Study Area is scheduled somewhat uniformly over the course of a day, with the busiest time between 10:00 AM and 11:00 AM.

Amtrak trains operating south of Washington Union Station (WUS) have coaches with trap doors, allowing them to access high- or low-level platform stations. South of WUS, Amtrak trains run on unelectrified freight track using diesel locomotives. Amtrak trains that serve stations both south of the District and on the Northeast Corridor must perform an engine change at WUS to use the electrified Northeast Corridor north of the station.

Virginia Railway Express Passenger Service

Routes and Service

VRE, a commuter railway serving Northern Virginia and the District, operates on two lines: the Fredericksburg Line and the Manassas Line. The two lines share track between Alexandria, Virginia, and the northern terminus at WUS, including through the Study Area.

VRE currently operates 16 trains per day on the Fredericksburg Line. These include eight inbound trains in the morning arriving at WUS between 6:30 AM and 9:30 AM, and seven outbound trains in the afternoon departing WUS between 3:00 PM and 7:00 PM, with one midday outbound departure at 12:55 PM.

VRE operates 16 trains per day on the Manassas Line. Six inbound morning trains arrive at WUS between 6:30 AM and 9:30 AM, and two evening inbound trains arrive at approximately 4:00 PM and 6:30 PM. In

Long Bridge Project

the outbound direction, there are six evening trips between 5:00 PM and 8:00 PM, as well as one morning and one midday departure.

Stations

There is one VRE station, L'Enfant Station, located within the Long Bridge Study Area (**Figure 6-4**). Located between 6th Street SW and 7th Street SW in the District, this station is the busiest station on the VRE system, with approximately 4,400 average weekday boardings. The station has a side platform served by a single track.

L'Enfant Station can be accessed by three entrances: stairs at the east end of the platform connect to 6th Street SW; stairs at the west end of the platform connect to 7th Street SW; and an Americans with Disabilities Act (ADA)-accessible ramp at the west end connects to Hancock Park on the station's north side. The L'Enfant Plaza Metrorail Station entrance is located approximately 150 feet north of the VRE station entrance at 7th Street SW.

A separate ongoing study is examining station and track improvements at L'Enfant Station.

6.5.2. Transit

WMATA Metrorail Passenger Service

Additional rail transit service in the Study Area includes WMATA Metrorail, which runs on a separate railroad facility than the CSXT tracks. Five Metrorail lines operate within the Study Area (**Figure 6-4**).

Metrorail runs underground in the Study Area, with the exception of a segment of the Yellow Line as it approaches and crosses the Potomac River. On the Virginia side, the Yellow Line shares a route with the Blue Line underground as far as the Pentagon Metrorail station (just outside the Study Area), where the lines split. The Yellow Line transitions from underground to above-ground via a portal approximately 425 feet southwest of the George Washington Memorial Parkway (GWMP). On the District side, the Yellow Line transitions from the above-ground segment to an underground segment via a portal located approximately 50 feet from the CSXT tracks, just northwest of the NPS maintenance yard. The Yellow Line joins the Green Line underground south of the L'Enfant Plaza Metrorail Station. The Yellow and Green Lines then run on a shared route underground through the southwest quadrant of the District. The Metrorail Blue, Orange, and Silver Lines run on a shared route underground in the District portion of the Study Area.

The Charles R. Fenwick Bridge, which is part of the 14th Street Bridge Complex, carries the Metrorail Yellow Line over the Potomac River. The Fenwick Bridge is located between the Long Bridge and the Arland D. Williams Jr. Memorial Bridge, which carries vehicular traffic on northbound I-395 and US 1. The Fenwick Bridge is approximately 180 feet northwest of the Long Bridge.

Figure 6-4 | VRE and Metrorail Lines and Stations



As shown in **Figure 6-4**, two Metrorail stations are located within the Study Area:

- L'Enfant Plaza Metrorail station. Located at 600 Maryland Avenue SW in the District, this station is an underground transfer station serving the Yellow, Green, Orange, Blue, and Silver Lines. In 2017, the L'Enfant Plaza Metrorail station was the fifth-busiest station (out of 91 stations total) on the Metrorail system, with 20,235 average weekday boardings.²⁸⁸
- The Smithsonian Metrorail station. Located at 1200 Independence Avenue SW, this station is an underground station serving the Orange, Blue, and Silver Lines. In 2017, the Smithsonian Metrorail station had 9,135 average weekday boardings.²⁷⁰

Local and Commuter Bus

Eighteen local bus routes, operated by three different agencies, operate within the Study Area.

Figure 6-5 shows a map of the bus routes and stops within the Study Area.

Three bus routes—Metrobus routes 5A, 16X, and 11Y—carry passengers between Virginia and the District using the 14th Street Bridge Complex.

Four Metrobus routes cross the Study Area in the District:

- Metrobus routes 52 and V1 cross over the CSXT tracks on 12th Street SW at Maryland Avenue SW;
- Metrobus route D51 crosses under the CSXT tracks on Maine Avenue SW, approximately 75 feet southeast of the 14th Street SW Bridge; and
- Metrobus route 5A crosses under the CSXT tracks on I-395, approximately 750 feet southwest of the Francis Case Memorial Bridge.

An additional three Metrobus routes—routes 74, A9, and W9—cross under the CSXT tracks on 7th Street SW, east of the Project Area but within the Study Area.

There is one Arlington Transit bus stop located in the Virginia portion of the Study Area, adjacent to Long Bridge Park. There are 27 Metrobus stops and two District Circulator bus stops within the Study Area in the District.

The Study Area is also served by several commuter bus services. Potomac and Rappahannock Transportation Commission's (PRTC's) Omniride, which operates service between Prince William County, Arlington County, and the District, has seven routes that traverse the Study Area. Loudoun County Transit runs nine routes through the area, and Martz Group Virginia, which serves the Fredericksburg area, has seven routes. Each of these routes travels across the 14th Street Bridge Complex and has stops in downtown Washington.

²⁸⁸ WMATA, 2017. Historical Metrorail Ridership. Accessed from https://www.wmata.com/about/records/public_docs/upload/2017_historical_rail_ridership.pdf. Accessed January 11, 2018.

Figure 6-5 | Local Bus Routes and Stops



6.5.3. Pedestrian and Bicycle Network

The Local Study Area features pedestrian and bicycle facilities in both the District and in Virginia, including sidewalk, on-street bicycle facilities, and shared-use trails, as shown in **Figure 6-6**.

In Virginia, the sidewalks in the Study Area are limited to the Long Bridge Park vicinity. Much of the Virginia portion of the Study Area is not conducive to walking due to large infrastructure elements, including highways and interchanges, the CSXT tracks, and the Metrorail portal and tracks.

The highest concentration of sidewalks can be found along the urban street network in the District. For the most part, sidewalk coverage along surface streets in the District portion of the Study Area is comprehensive, with continuous sidewalk on both sides of the roadways on all surface streets except for Frontage Road SW between 6th Street and 12th Street SW, which has sidewalks on the north side only. While the numerous bridges and elevated roadways in the Study Area—including those structures carrying I-395 and the CSXT tracks—can present a psychological barrier to pedestrian mobility, there are numerous north-south sidewalk connections over and under these facilities.

The parkland on both sides of the Potomac River features extensive trail networks that provide mobility within the parks themselves as well as north-south mobility along the Potomac River. The most notable of these is the Mount Vernon Trail, an 18-mile paved shared-use path that runs between Mount Vernon in Fairfax County, Virginia, and the Custis Trail in north Arlington County, Virginia, with a connection to Four Mile Run in South Arlington. The Mount Vernon Trail, which is owned and maintained by NPS, is popular among both recreational users and commuters, and provides active transportation connectivity within Northern Virginia and access to trail connections into the District. Based on automated counts along the Mount Vernon Trail near Washington Reagan National Airport, approximately 1.25 miles south of the Study Area, the Mount Vernon Trail carried 2,241 bicyclists and 169 pedestrians through the Study Area on an average weekday in July 2017.²⁸⁹

Within and just beyond the Study Area, off-street paths can be found along the GWMP, on the National Mall, and in East and West Potomac Park; these trails are primarily used for recreation and for accessing historic and memorial sites. Just southeast of the Study Area in the District, an off-street trail along Maine Avenue SW provides pedestrian and bicycle connectivity along the Southwest Waterfront.

Two trails in the Study Area cross the Long Bridge Project Area: the Mount Vernon Trail crosses under Long Bridge approximately 50 feet southwest of the Potomac River, and a shared-use path along Ohio Drive SW crosses under the railroad bridge approximately 225 feet southeast of East Basin Drive SW. There are north-south sidewalk connections across the Study Area in the District along 12th Street SW, 10th Street SW, 9th Street SW, and 7th Street SW.

²⁸⁹ BikeArlington. Undated. Counter Dashboard. Accessed from <http://counters.bikearlington.com/>. Accessed January 11, 2018.

Figure 6-6 | Trails, Bike Lanes, and Bikeshare Locations



The Potomac River and the Washington Channel and Tidal Basin are the largest and most obvious natural barriers to pedestrian and bicycle mobility in the Study Area. There is one pedestrian and bicycle connection over the Potomac River in the Study Area via the George Mason Memorial Bridge, which carries southbound traffic on I-395. There is a 10-foot shared-use path on the upriver side of the bridge, separated from vehicular traffic by a jersey barrier and railing. The George Mason Memorial Bridge path had an average weekday volume of 2,247 bicyclists and 303 pedestrians in July 2017.²⁹⁰

The sidewalk along Ohio Drive SW and a shared-use path on the Francis Case Memorial Bridge, which carries I-395 over Washington Channel, provide pedestrian and bicycle connections over the Channel and Tidal Basin. These facilities connect the National Mall, L'Enfant Plaza, and the southwest waterfront with East and West Potomac Parks.

There is one on-street bike facility located in the Study Area: a northbound bike lane on Long Bridge Drive in Arlington County, Virginia, that connects Long Bridge Park to Crystal City via an off-street trail and bike lanes on Crystal Drive, both located just south of the Study Area.

In the District, there is a raised cycle track along Main Avenue SW in the vicinity of the Wharf. Bike lanes on 4th Street SW and on I (Eye) Street SW are located just outside the Study Area.

Capital Bikeshare is available in both the District and Virginia portions of the Study Area. Seven Capital Bikeshare stations—five in the District and two in Virginia—fall within the Study Area boundary at the following locations:

- 6th Street S. and S. Ball Street in Arlington County, Virginia
- Long Bridge Drive and 6th Street S. in Arlington County, Virginia
- Ohio Drive SW and Buckeye Drive SW in the District
- East Basin Drive SW at the Jefferson Memorial in the District
- 7th Street SW and C Street SW in the District
- Independence Avenue SW and L'Enfant Plaza SW in the District
- 12th Street SW and Independence Avenue SW in the District

Dockless bikeshare is also available in the Study Area. Dockless bikes are available through a number of providers as part of a demonstration project being conducted throughout the District.

6.5.4. Roadway Network

As shown in **Figure 6-7**, the Long Bridge Study Area includes high-volume roadways that provide critical access and mobility between and within the District and Virginia, including I-395, the GWMP, and US 1. . The Local Study Area also includes park roads, such as Ohio Drive SW and East Basin Drive, that provide access to and mobility within East Potomac Park and West Potomac Park. DDOT classifies both of these

²⁹⁰ BikeArlington. Undated. Counter Dashboard. Accessed from <http://counters.bikearlington.com/>. Accessed January 11, 2018.

roadways as local streets.²⁹¹ Following is a description of each of the high-volume major roadways (such as interstates and arterials) as it relates to the Study Area:

- I-395 is a freeway that runs approximately 13 miles between the interchange with I-95 and I-495 in Springfield, Virginia, and US 50 (New York Avenue NW) in the District, with a connection to I-695 in the District. It provides access between Northern Virginia and the District, and carries high volumes of commuter traffic during weekday peak hours. Within the study area, I-395 is located on an elevated structure on both sides of the Potomac River, and crosses the river via the 14th Street Bridge Complex, just west of Long Bridge. The freeway shares a designation with US 1 as it crosses the river. I-395 passes under the CSXT railroad tracks approximately 600 feet west of the NPS maintenance facility in East Potomac Park.
- US 1 runs the entire length of the eastern seaboard, generally paralleling I-95. Within the Study Area, US 1 provides connections between the District; Arlington County, Virginia; Alexandria, Virginia; and other locations in Northern Virginia, and carries high volumes of commuter traffic during weekday peak hours. US 1 has multiple configurations within the study area. Just southwest of the Study Area, US 1 is a six-lane Principal Arterial, known as Jefferson Davis Highway, as it passes through Crystal City before joining I-395. It crosses the Potomac River via the 14th Street Bridge Complex. On the District side of the river, it runs on an elevated structure until D Street SW, where it becomes 14th Street SW, a six-lane surface roadway classified as a Principal Arterial.
- The GWMP is an NPS unit that features an approximately 25-mile divided parkway and associated historic landscape along the Potomac River in Arlington County and Fairfax County, Virginia, and the District. Within the Study Area, the GWMP is a six-lane limited-access parkway, with connections to I-395 and US 1. The Parkway passes under the CSXT tracks in Arlington County, Virginia, approximately 350 feet southwest of the Potomac River.
- The 12th Street Expressway and the 9th Street Expressway each provide a tunneled route under the National Mall and connect I-395 with the downtown street grid. The 12th Street Expressway crosses over the CSXT tracks at D Street SW. The 9th Street Expressway passes under the CSXT tracks just north of D Street SW.
- Independence Avenue SW is an east-west roadway on the south side of the National Mall in the District. Independence Avenue provides connections between I-395, US 1, and I-66 and major office uses in and around Downtown. Within the Study Area, the roadway is classified as a Principal Arterial and has a six-lane cross-section in most segments.
- Maine Avenue SW is a four-lane Minor Arterial that provides connections between I-395 and US 1; office, retail, and entertainment destinations in the Southwest and Southeast quadrants of the District; and the National Mall. Maine Avenue SW passes under the CSXT tracks approximately 300 feet north of the Washington Channel.

²⁹¹ DDOT. District of Columbia Functional Classification Map. September 2016. Accessed from https://ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/FunctionalClass_2016.pdf. Accessed May 21, 2018.

Altogether, these roadways carry approximately 375,000 vehicles daily through the Study Area. **Table 6-1** shows the AADT for each of the roadways in 2015.

Figure 6-7 | Major Roadways



Table 6-1 | 2015 Traffic Volumes on Major Study Area Roadways

Roadway Segment	AADT	Functional Classification
I-395 and US 1 (14 th Street Bridge)	234,500	Interstate
US 1 (14 th Street SW)	41,500	Other Principal Arterial
George Washington Memorial Pkwy	62,000	Other Principal Arterial
12th Street and 9th Street Expressways	N/A	Other Freeway and Expressway
Independence Avenue SW	27,500	Principal Arterial
Maine Avenue SW	13,700	Minor Arterial

¹ FHWA provides the following definitions for the functional classifications in this table:

- *Interstates are the highest classification of arterials and were designed and constructed with mobility and long-distance travel in mind. Roadways in this functional classification category are officially designated as Interstates by the Secretary of Transportation.*
- *Other Freeways and Expressways, like interstates, are designed to maximize their mobility function. They have directional travel lanes usually separated by a physical barrier, and their access and egress points are limited to on- and off-ramp locations or a very limited number of at-grade intersections.*
- *Other Principal Arterials serve the major activity centers of a metropolitan area and the highest volume traffic corridors. They carry a significant amount of intra-area travel and serve demand between the central business district and outlying residential areas.*
- *Minor Arterials provide service for trips of moderate length, serve geographic areas that are smaller than their higher arterial counterparts, and offer connectivity to the higher arterial system.*

Sources: DDOT, VDOT

In addition to these high-volume roadways and their associated ramps, the Study Area includes numerous surface roadways that are part of the urban street grid in the District and in Crystal City. The Study Area also includes park roads, such as Ohio Drive SW, that provide access to and mobility within East Potomac Park and West Potomac Park.

There are multiple roadway owners in the Study Area, including Arlington County, DDOT, VDOT, and NPS. Maryland Avenue SW, located above the CSXT tracks just southwest of 12th Street SW, is owned by a private entity, FLH Company.

6.5.5. Parking

There are several streets with on-street metered parking in the Long Bridge Study Area, most of which are located in the District. Any disruptions to roadway operations or changes to roadway geometry on these roadways could impact the supply of on-street parking.

The Portals development along Maryland Avenue SW, which is situated on a deck over the CSXT tracks, currently includes approximately 1,200 off-street parking spaces across three facilities. The Portals Parking Garage can be accessed via both Maryland Avenue SW and Maine Avenue SW; the Mandarin Oriental Hotel garage access is located in the 1200 block of Maine Avenue SW; and the Portals III garage access is located in the 1300 block of D Street NW. The Portals V residential tower, a 373-unit building slated for completion in 2019, will be located adjacent to the Portals III building between the CSXT tracks

and D Street NW. The building will include 387 off-street parking spaces, with access from D Street NW. . . . Parking lots within East Potomac Park provide 289 public parking spaces. In addition, the public makes use of some of the 336 parking spaces at the National Capital Region headquarters on weekends, particularly during periods of high demand such as the National Cherry Blossom Festival.

All surface streets with metered parking in the District portion of the Study Area are located in a Premium Demand Zone, with rates ranging from \$2.00 to \$2.30 an hour.

Table 6-2 shows parking allowances and restrictions on surface streets in the Study Area.

Table 6-2 | On-Street Parking in the Study Area

Street Name	Jurisdiction	On-Street Parking Permitted?	Time Restriction	Type
Long Bridge Drive	Arlington	Yes	4 hours	Pay/Display
Ohio Drive SW (south of Buckeye Drive)	NPS	Yes, along some sections, except overnight	3 hours	Pay/Display
Ohio Drive SW (north of Buckeye Drive)	NPS	Majority of on-street parking by permit only; some public parking on west side of street	3 hours (for public spaces)	Free
Maine Avenue SW	District	No	N/A	N/A
Frontage Road SW	District	Yes, north side only	2 hours	Meters
D Street SW (14th Street to 12th Street)	District	Yes	2 hours	Pay/Display
D Street SW (12th Street to L'Enfant Plaza)	District	No	N/A	N/A
D Street SW (L'Enfant Plaza to 9th Street)	District	Yes, one side only (alternates)	2 hours	Pay/Display
C Street SW (14th Street to 12th Street)	District	Yes	2 hours	Pay/Display
C Street SW (9th Street to 7th Street)	District	Yes, north side only	2 hours	Pay/Display
Independence Avenue SW	District	Yes, except rush hour	2 hours	Pay/Display
14th Street SW	District	No	N/A	N/A
13th Street SW	District	Yes	2 hours	Pay/Display
12th Street SW	District	Yes, except rush hour	2 hours	Pay/Display
L'Enfant Plaza SW	District	Yes	2 hours	Meters
9th Street SW	District	Yes	2 hours	Pay/Display
7th Street SW	District	Yes, except rush hour	2 hours	Pay/Display and Meters

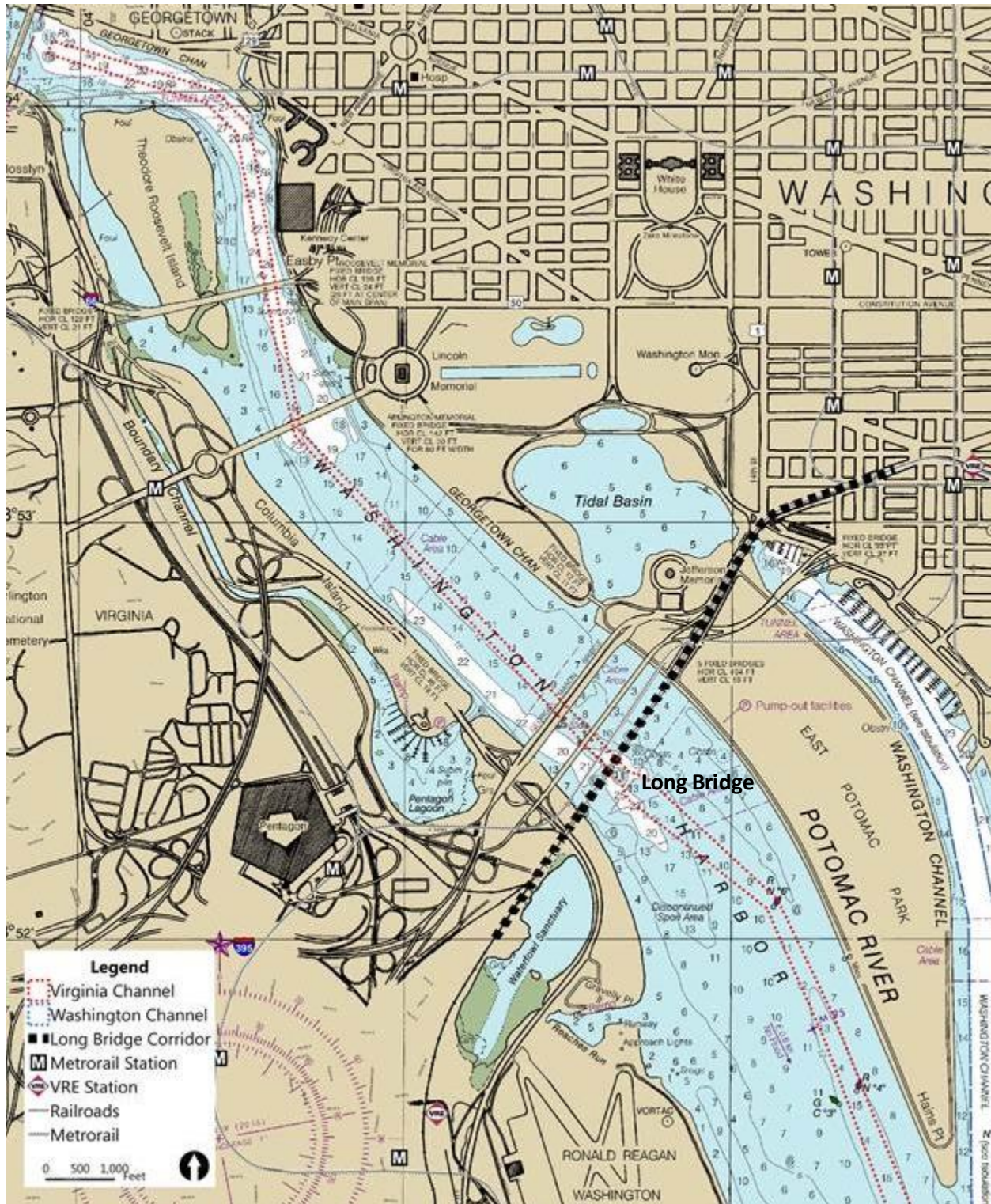
Sources: DDOT, Arlington County

Given the high-density development and prevalence of office uses in both the District and Virginia portions of the Study Area, there are numerous structured parking facilities, most of which are located underground. The vast majority of this parking is located in the District.

6.5.6. Navigable Waters

Marine vessel traffic in the Study Area consists of both private recreational and commercial tourism use. Marine vessel traffic on the Potomac River is currently limited by the Long Bridge, as it has the most restrictive vertical clearance of the 14th Street Bridge Complex. The vertical clearances of the other 14th Street Bridge Complex bridges would also limit some larger vessels from navigating farther upstream. A Federal navigation channel (the Virginia Channel) maintained by the USACE runs through the Potomac River and is directed under the swing span (spans 9 and 10) of the Long Bridge. NOAA Nautical Chart US12285 identifies the shallowest depth within the channel under the Long Bridge as approximately 11 feet, as measured at mean low water from the surface of the water to the riverbed (**Figure 6-8**). The depths of the channel under the 14th Street Bridge Complex range from 9 to 25 feet. The navigation channel in the Washington Channel does not extend underneath the railroad bridges that cross the Washington Channel at the mouth of the Tidal Basin.

Figure 6-8 | Potomac River Depths, with Virginia Channel Identified



Source: NOAA Nautical Chart US12285 and USACE 2015 Condition Survey

Long Bridge Project

While the Potomac River is navigable for motorized vessels for approximately 3.25 miles upriver of the Long Bridge, much of the traffic navigating under Long Bridge consists of small recreational motorized and non-motorized vessels due to the vertical clearance limitations. Most larger vessels launch or dock at the marinas in the Washington Channel, along the Anacostia River, or downstream of the Long Bridge.

There is one marina, the Washington Marina Company, located within the Long Bridge Study Area. The marina is located on the eastern shore of the Washington Channel near the District Wharf, just south of where the CSXT tracks cross the Washington Channel (**Figure 6-9**). The marina has 179 annual, seasonal, and transient slips for vessels 20 to 100 feet in length. The company DC Harbor Cruises is based out of the marina.

Three marinas are located just outside the Study Area:

- **Gangplank Marina.** Located at District Wharf on the Washington Channel, Gangplank Marina features 309 annual, seasonal, and transient slips that can accommodate vessels up to 125 feet in length. The marina includes a houseboat community with more than 90 “live-aboard” residents. Carefree Boat Club, which has fleet vessels for use by members, is housed at Gangplank Marina.
- **The Capital Yacht Club.** Located at District Wharf on the Washington Channel, the club has 100 slips available to members and guests that can accommodate vessels up to 160 feet in length.
- **Columbia Island Marina.** Located on the Pentagon Lagoon in Arlington County, Virginia, upriver of Long Bridge, the marina has 256 annual slips ranging from 20 feet to 50 feet in size, as well as 126 twenty-foot seasonal slips. The marina primarily serves powerboats.

The District Wharf also features the Wharf Boathouse, which houses and rents non-motorized vessels. Several commercial cruises and yachts operate on the Potomac River in the Study Area; however, due to the vertical clearance limitations of the Long Bridge and the 14th Street Bridge Complex, most of these vessels operate only downriver of the Long Bridge. A notable exception is the Odyssey III, which operates dinner cruises on the Potomac River and can travel north of the Long Bridge at low tide. Select water taxi services also pass under the 14th Street Bridge Complex. The water taxi provides service between the Wharf, Georgetown, Old Town Alexandria, and National Harbor. In addition, a 6-person jitney operates approximately every 15 minutes between East Potomac Park and the Wharf from March through December.

The Wharf Jitney, an electric-powered ferry that transports passengers between The Wharf and East Potomac Park, traverses the Washington Channel, but does not operate on the Potomac River or pass under the 14th Street Bridge Complex.

No commercial facilities receive barge deliveries along the Potomac River upriver of Long Bridge. There is limited potential for commercial operations, aside from passenger transport, upriver of Long Bridge since most of the waterfront along this segment of the river is Federal, state, or District parkland.

Within the Local Study Area are several features protected under Section 14 of the Rivers and Harbors Act of 1899. These include the sea wall surrounding East Potomac Park and the Tidal Basin and the

Washington Marina, which was constructed between 1939 and 1941 by the Works Progress Administration as “Yacht Basin One.”²⁹²

²⁹² The Washington Marina Company. Our History. Accessed from <https://www.washingtonmarina.com/our-history/>. Accessed July 15, 2019.

Figure 6-9 | Marinas and Boathouses near and within the Study Area



7.0 Air Quality

7.1. Overview

This section defines the air quality resource category set forth by the U.S. Environmental Protection Agency (EPA) and the Clean Air Act (CAA), and discusses the existing conditions of air quality for the Long Bridge Project. Air pollution is a general term that refers to one or more substances determined to degrade the quality of the atmosphere. Six main air pollutants, collectively referred to as criteria pollutants, have been identified by the EPA as being of nationwide concern, based on their potential effect on human health:

1. Carbon monoxide (CO)
2. Sulfur oxides (SO_x), including sulfur dioxide (SO₂)
3. Nitrogen oxides (NO_x), including nitrogen dioxide (NO₂)
4. Ozone (O₃)
5. Particulate matter sized 10 micrometers or less (PM₁₀) and sized 2.5 micrometers or less (PM_{2.5})
6. Lead (Pb)

7.1.1. Criteria Pollutants

Under authority of the CAA, EPA has established National Ambient Air Quality Standards (NAAQS) for criteria pollutants to protect the public health and welfare. Ambient air is generally defined as the portion of the atmosphere, external to buildings, to which the public has access. The criteria pollutants which are of significance to the transportation sector include CO, NO₂, O₃, PM₁₀, and PM_{2.5}. The criteria pollutants which are not of significance to the transportation sector include SO₂ and Pb. These pollutants are generally not emitted in substantial quantities by the transportation sector since regulations have limited the amount of sulfur and lead allowed in the composition of fuels. The NAAQS are summarized in **Table 7-1** | National Ambient Air Quality Standards

Pollutant	Averaging Period	Primary Standard	Secondary Standard	Form
CO	8-hour	9 ppm	-	Not to be exceeded more than once per year
	1-hour	35 ppm	-	
NO ₂	1-hour	100 ppb	-	98 th percentile of daily maximum concentrations, averaged over 3 years
	1-year ^a	53 ppb	53 ppb	Annual mean
O ₃	8-hour ^b	0.070 ppm	0.070 ppm	Annual 4th highest daily maximum concentration, averaged over 3 years
	1-year	12 µg/m ³	15 µg/m ³	Annual mean, averaged over 3 years
PM _{2.5}	24-hour	35 µg/m ³	35 µg/m ³	98 th percentile, averaged over 3 years

Pollutant	Averaging Period	Primary Standard	Secondary Standard	Form
PM10	24-hour	150 µg/m ³	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
SO2	1-hour ^c	75 ppb	-	99 th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	3-hour	-	0.5 ppm	Not to be exceeded more than once per year
Pb	Rolling 3-month average ^d	0.15 µg/m ³	0.15 µg/m ³	Not to be exceeded

Source: EPA 2016a

Notes: *a - The level of the annual NO2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.*

b - Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

c - The previous SO2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO2 standards or is not meeting the requirements of a State Implementation Plan (SIP) call under the previous SO2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

d - In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.

(ppm) – parts per million; (ppb) – parts per billion; (µg/m³) – micrograms per cubic meter

Should an area be designated as Nonattainment, a State Implementation Plan (SIP) is required to demonstrate a pathway back to NAAQS compliance. A SIP identifies how the state will attain and maintain the primary and secondary NAAQS, including Federally enforceable requirements. There is a SIP for the District of Columbia and Virginia. The Long Bridge Project is in the District and Arlington County, which have been designated as Nonattainment areas for 8-hour ozone and Maintenance areas for CO and PM2.5.

Projects that are proposed in a Nonattainment or Maintenance area must show conformity with the SIP. Conformity is showing agreement to a SIP's purpose of reducing the severity of or eliminating the NAAQS violation(s) in the area. Conformity requires that a project will not:

- Cause or contribute to any new violation of the NAAQS
- Increase the frequency or severity of any existing violation of the NAAQS
- Delay the attainment of the NAAQS

EPA promulgated the final General Conformity regulations in 40 CFR 93 Subpart B for all Federal activities except those covered under the Transportation Conformity.²⁹³ FRA activities are not covered

²⁹³ 40 CFR 93 Subpart A

under Transportation Conformity as FRA is exempt from the applicability criteria listed in 43 CFR 93.102. Transportation Conformity only addresses air pollution from on-road mobile sources and projects that are exempt include specific projects under the categories of safety, mass transit, and air quality; therefore, General Conformity regulations apply to the Project.²⁹⁴ The EPA has established *de minimis* thresholds (minimum thresholds) for which a conformity determination must be performed for various criteria pollutants. These thresholds are presented in **Table 7-2**.

Table 7-2 | General Conformity *de minimis* Emission Levels

Pollutant	Tons per Year	Area Type
Ozone (Volatile Organic Compound [VOC] or NOx)	50	Serious Nonattainment
	25	Severe Nonattainment
	10	Extreme Nonattainment
	100	Other Areas Outside an Ozone Transport Region
Ozone (NOx)	100	Marginal and Moderate Nonattainment Inside an Ozone Transport Region
	100	Maintenance
Ozone (VOC)	50	Marginal and Moderate Nonattainment Inside an Ozone Transport Region
	50	Maintenance Within an Ozone Transport Region
	100	Maintenance Outside an Ozone Transport Region
CO, SO₂, and NO₂	100	All Nonattainment and Maintenance
PM₁₀	70	Serious Nonattainment
	100	Moderate Nonattainment and Maintenance
PM_{2.5}^a	100	All Nonattainment and Maintenance
Pb	25	All Nonattainment and Maintenance
Source: EPA 2016b Notes: a - Direct emissions, SO ₂ , NOx (unless determined not to be a significant precursor); VOC or ammonia (if determined to be a significant precursor)		

7.1.2. Mobile Source Air Toxics

Most air toxics originate from human-made sources, including on-road mobile sources and non-road mobile sources such as combustion engines used in vehicles, locomotives, and construction equipment. Controlling air toxic emissions became a national priority with the passage of the CAA Amendments (CAAA) of 1990, whereby Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants.²⁹⁵

²⁹⁴ U.S. Department of Transportation, Federal Highway Administration. Undated. Transportation Conformity. Accessed from https://www.fhwa.dot.gov/environment/air_quality/conformity/. Accessed July 25, 2017.

²⁹⁵ Environmental Protection Agency. 2007. Final Rule for Control of Hazardous Air Pollutants from Mobile Sources. Accessed from <https://www.epa.gov/mobile-source-pollution/final-rule-control-hazardous-air-pollutants-mobile-sources>. Accessed June 6, 2017.

The EPA assessed this expansive list in its rule on the *Control of Hazardous Air Pollutants from Mobile Sources*, and identified a group of 93 compounds emitted from mobile sources that are part of EPA's Integrated Risk Information System (IRIS).²⁹⁶ In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the *2011 National Air Toxics Assessment* (NATA).²⁹⁷ These are 1,3-butadiene; acetaldehyde; acrolein; benzene; diesel particulate matter (diesel PM); ethylbenzene; formaldehyde; naphthalene; and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics (MSATs), the list is subject to change and may be adjusted in consideration of future EPA rules.

7.2. Regulatory Context and Guidance

7.2.1. Air Quality Federal Laws, Regulations, and Other Guidance

The following laws, regulations, and agency jurisdiction and management guidance are pertinent to air quality resources. Key regulations and guidance that are most relevant to the Long Bridge Project are listed below.

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- CAA of 1970 and its amendments of 1990²⁹⁸
- General Conformity Rule (176(c)(4)(C)) of the CAA
- National Environmental Policy Act of 1969²⁹⁹

²⁹⁶ 72 FR 8430

²⁹⁷ Environmental Protection Agency. Undated. National Air Toxics Assessment. Accessed from <https://www.epa.gov/national-air-toxics-assessment>. Accessed June 6, 2017.

²⁹⁸ 42 USC 7401

²⁹⁹ 42 USC 4321

Relevant Federal Guidance

- FRA Procedures for Considering Environmental Impacts³⁰⁰

7.2.2. Air Quality State and Local Laws, Regulations, and Other Guidance

Virginia's ambient air quality standards are reflective of the NAAQS outlined in **Table 7-1**.³⁰¹ The Virginia Department of Transportation (VDOT) has developed extensive guidance for conducting air quality analysis related to mobile source emissions at a project-level to demonstrate Transportation Conformity.³⁰² Since FRA is generally not subject to Transportation Conformity, the Long Bridge Project will demonstrate compliance with the District and Virginia's SIPs and budgets by demonstrating General Conformity.³⁰³

The District Department of Energy and Environment (DOEE) enforces the District's air quality regulations. The purpose of the regulations is to prevent or minimize emissions into the atmosphere to protect and enhance the quality of the District's air resources. These regulations apply to:

- Controlling emissions from both stationary sources and mobile sources to the extent allowed by Federal regulations and the CAA.³⁰⁴
- Controlling fugitive dust or non-point particulate matter emission into the atmosphere that results from a mechanical disturbance such as dust blown into the air from a dirt pile by the wind, or particles becoming airborne as a result of vortexes created by tires of passing vehicles (re entrained). Fugitive dust is typically of concern during construction activities and, per the regulation, must be controlled for unpaved roads, unpaved parking lots, transport of dusty material, demolition, and other scenarios likely to involve fugitive dust emissions.³⁰⁵
- Controlling on-road engine and non-road diesel engine idling.³⁰⁶

Arlington County does not have regulations or ordinances that govern air pollutant emissions. Air quality is instead primarily regulated at the state level.

Relevant State and Local Guidance:

- Project-Level Air Quality Analysis Resource Document, Version 1.0, VDOT, April 2016

³⁰⁰ 64 FR 28545

³⁰¹ 9 VAC 5-30

³⁰² Virginia Department of Transportation. April 2016. Project-Level Air Quality Analysis Resource Document, Version 1.0. Accessed from http://www.virginiadot.org/projects/resources/air/VDOT_Project-Level_Air_Quality_Resource_Document_ver_4-27-16.pdf. Accessed April 26, 2018.

³⁰³ 9 VAC 5-160

³⁰⁴ DCMR 20-1-15

³⁰⁵ DCMR 20-6

³⁰⁶ DCMR 20-9

7.3. Study Area

The air quality resource area is studied at both the local and regional levels. Local analyses are called microscale or “hot-spot” analyses and focus on pollutant concentrations in publicly accessible spaces. Regional analyses are called mesoscale analyses and focus on pollutant inventories and the mass of pollutants being emitted by a project.

The Local Study Area focuses on locations around the Project’s emission sources where the public has access to ambient air. In addition, the Local Study Area will include sensitive receptor locations accessible by the public around the Long Bridge Project, where impact from increased train activity could be felt. The Local Study Area is shown in **Figure 7-1**.

The Regional Study Area will be used for all regional mesoscale air quality analyses conducted for the Project. The Regional Study Area is typically defined as the county or counties in which a project is located. For the Long Bridge Project, the Regional Study Area will be defined as the District and Arlington County, Virginia, including data collection sources such as air quality monitoring levels from the Aurora Hills Visitor Center and meteorological data from Ronald Reagan Washington National Airport, both in Arlington, Virginia (**Figure 7-2**). This agrees with the methodology used by the EPA to regulate air attainment status for the area.

7.4. Methodology

The regional climate and metrological conditions in the Study Area were determined based on publicly available data from the National Oceanic and Atmospheric Administration (NOAA) and National Weather Service. This information included data on historical temperatures, precipitation, wind speeds, and distributions.

The existing ambient air quality conditions were obtained from DOEE, the Virginia Department of Environmental Quality (VDEQ), and EPA air quality monitoring data. This information was retrieved from the Ambient Air Monitoring Network Plans and the EPA AirData Database. The design value concentrations, which are used to determine whether an area is attaining (meeting) NAAQS for Ozone was determined for the Project’s criteria pollutants as regulated by the NAAQS.

The current attainment status of the Regional Study Area was confirmed based on the EPA Federal Register Notices. This information is also available from the EPA’s Greenbook. The attainment status for the criteria pollutants regulated by the NAAQS was confirmed for the District and Arlington County. The Project is located in the District and Arlington County, which have been designated as Nonattainment Areas for 8-hour ozone and Maintenance Areas for CO and PM_{2.5}. In addition, the Air Quality Index (AQI) for ozone and PM was summarized for the study area.³⁰⁷

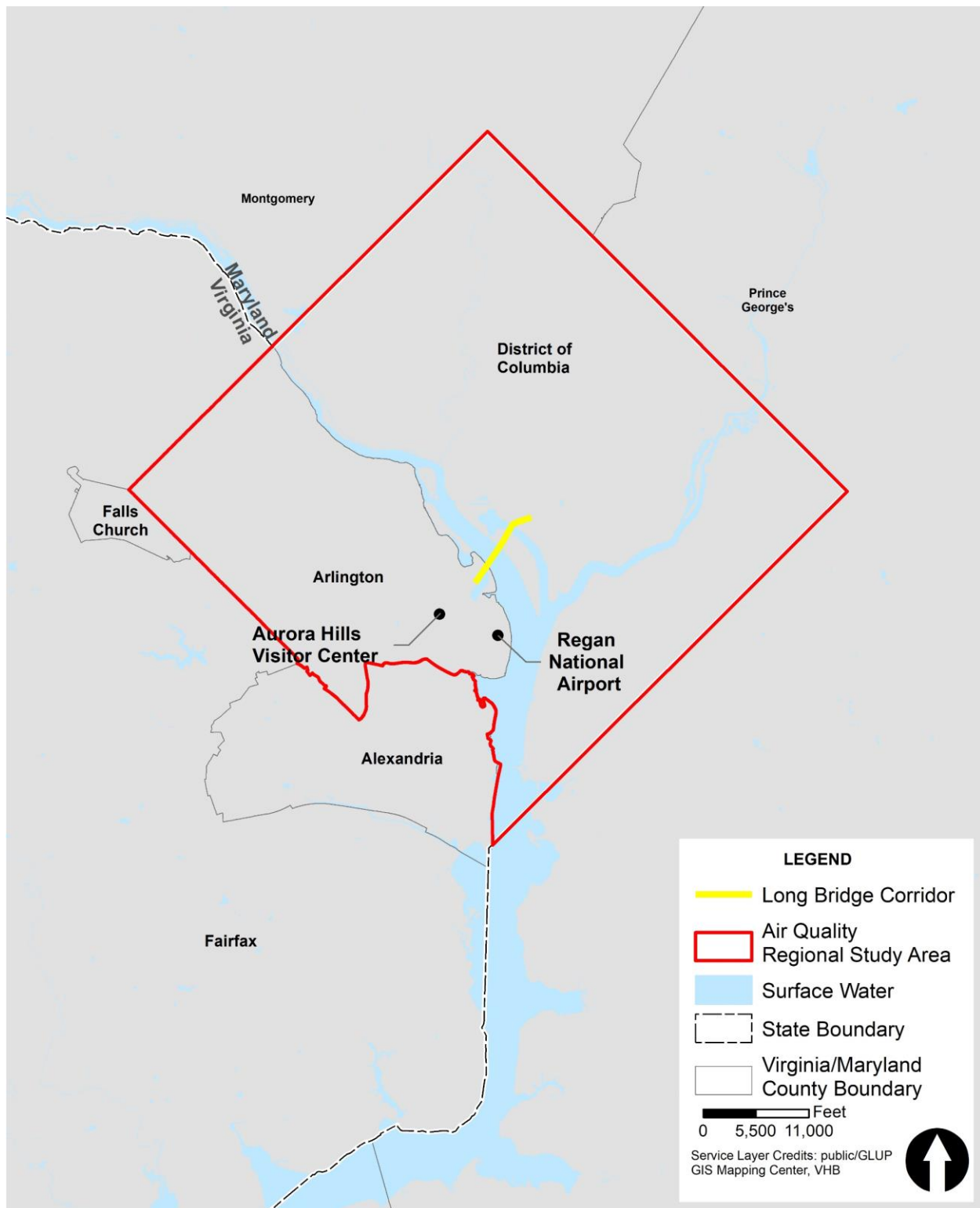
Existing conditions related to mobile sources were determined. The Regional Assessment and General Conformity analysis included VOCs, NO_x, CO, and PM_{10/2.5} emissions inventories that included the existing diesel locomotive emissions within the Regional Study Area.

³⁰⁷ The AQI will be based on the AirNow website at <https://www.airnow.gov>.

Figure 7-1 | Local Study Area for Air Quality



Figure 7-2 | Regional Study Area for Air Quality



7.5. Affected Environment

This section summarizes the baseline air quality information for the Project and the existing conditions based on an initial assessment of the Study Area.

7.5.1. Regional Climate Setting

Regional climate and meteorological conditions can substantially affect air quality across the region. Emission, transport and dispersion of pollutants are highly dependent on wind speed, wind direction, air temperature, precipitation, humidity and other meteorological factors. Generally, the District and the Study Area is characterized as a humid subtropical climate. This category typically experiences hot and humid summers, cold winters with light snowfall, and annual precipitation occurring throughout the year.

Table 7-3 presents the representative monthly climate data for the region based on meteorological data from Ronald Reagan Washington National Airport, which is near the proposed Project. The meteorological parameters shown include mean maximum, average and minimum temperatures, mean precipitation, and mean snowfall by month.

Table 7-3 | Representative Climate Data near the Proposed Project

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Maximum Temperature (°F)	43.4	47.1	55.9	66.6	75.4	84.2	88.4	86.5	79.5	68.4	57.9	46.8
Mean Average Temperature (°F)	36.0	39.0	46.8	56.8	66.0	75.2	79.8	78.1	71.0	59.5	49.6	39.7
Mean Minimum Temperature (°F)	28.6	30.9	37.6	47.0	56.5	66.3	71.1	69.7	62.4	50.6	41.2	32.5
Mean Precipitation (in)	2.81	2.62	3.48	3.06	3.99	3.78	3.73	2.93	3.72	3.40	3.17	3.05
Mean Snowfall (in)	5.6	5.7	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	2.3

Source: NWS 2016³⁰⁸

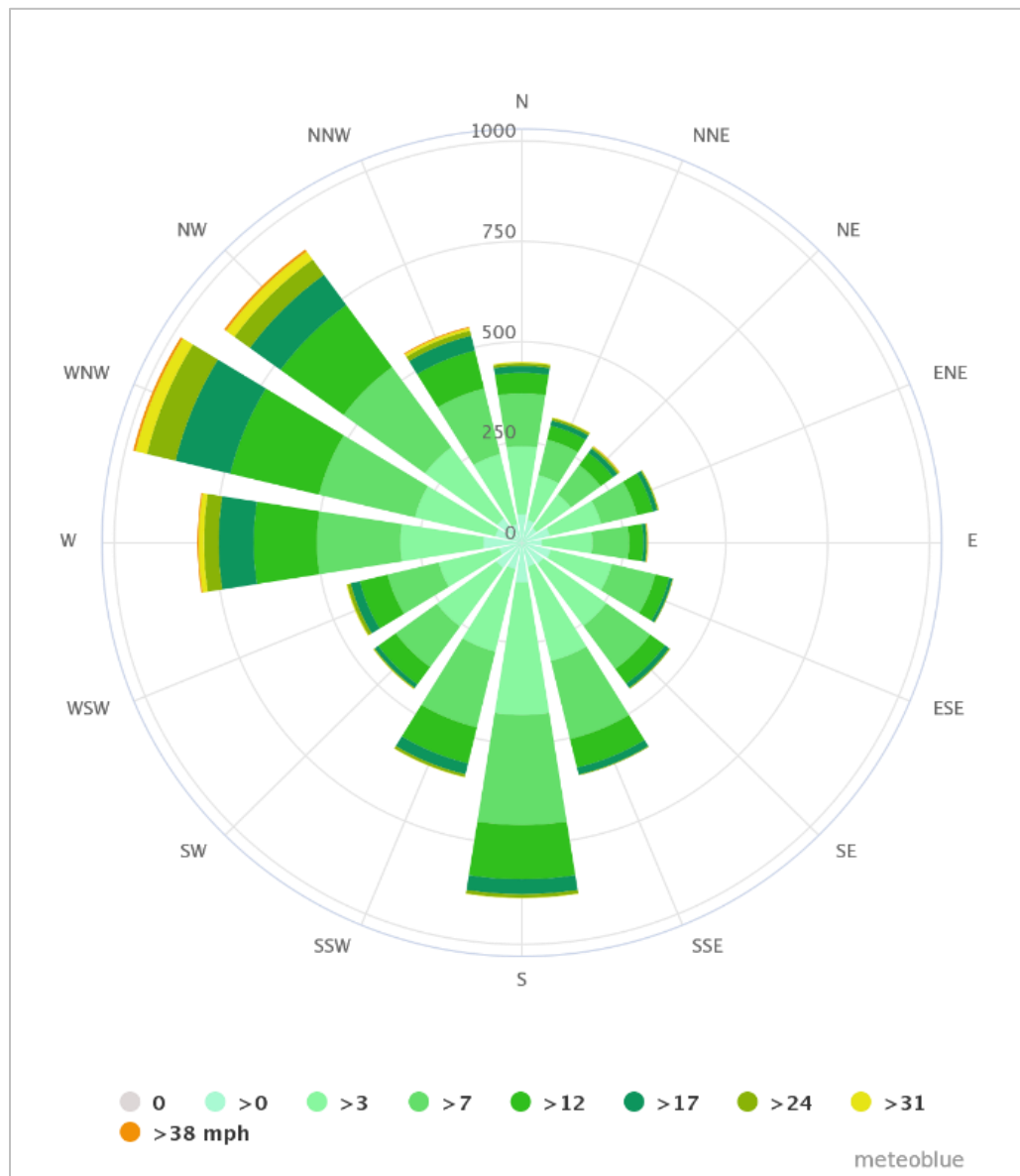
Note: All values represent monthly normals based on weather data from 1981-2010.

(°F) – Degrees Fahrenheit; (in) – inches

Wind speed, wind direction, and atmospheric stability greatly influence pollutant transport and dispersion. When reviewing historical wind data, a high frequency of a particular wind direction, coupled with low wind speeds and a stable atmosphere, can indicate poor pollutant dispersion and potential concentration hot-spots. The historical wind rose for the District is presented in **Figure 7-3**, showing that the predominant wind direction in the area is from the west-northwest.

³⁰⁸ National Weather Service. Undated. DCA Normals, Means, and Extremes. Accessed from <http://www.weather.gov/lwx/dcanme>. Accessed June 29, 2017.

Figure 7-3 | Representative Wind Rose for the Study Area



Note: (mph) – miles per hour

Source: (Meteo Blue, 2017).³⁰⁹

³⁰⁹ Met Blue. Undated. Wind Rose Washington D.C. Accessed from https://www.meteoblue.com/en/weather/archive/windrose/washington-d.c._united-states-of-america_4140963. Accessed June 29, 2017.

7.5.2. Ambient Air Quality

Ambient air is generally defined to mean the portion of the atmosphere, external to buildings, to which the general public has access. The CAA requires the EPA to set standards on the pollutants that are considered potentially harmful to public health and the environment at ambient concentrations. As outlined in **Table 7-4**, the NAAQS apply to seven principal (criteria) pollutants: CO, NO₂, O₃, PM_{2.5}, PM₁₀, SO₂, and Pb. Air pollution is of concern because of its demonstrated effects on human health. Of particular concern are the respiratory effects of the criteria pollutants and their potential toxic effects, as described in **Determine compliance** with the NAAQS;

Characterize air quality and pollutant trends;

Estimate health risks and ecosystem impacts;

Develop and evaluate emission control strategies;

Evaluate source-receptor relationships;

Provide input data for models and evaluating models;

Measure overall progress of air pollution control programs; and

Inform air quality forecasts and other public outreach air quality reports.

Table 7-4

- Determine compliance with the NAAQS;
- Characterize air quality and pollutant trends;
- Estimate health risks and ecosystem impacts;
- Develop and evaluate emission control strategies;
- Evaluate source-receptor relationships;
- Provide input data for models and evaluating models;
- Measure overall progress of air pollution control programs; and
- Inform air quality forecasts and other public outreach air quality reports.³¹⁰

³¹⁰ Department of Energy and Environment, Air Quality Division, Monitoring and Assessment Branch. 2017. District of Columbia 2017 Annual Ambient Air Monitoring Network Plan. June 2016.

Table 7-4 | Description of the Criteria Pollutants.

Pollutant	Description
CO	CO is a colorless and odorless gas that is a product of incomplete combustion. CO is absorbed by the lungs and reacts with hemoglobin to reduce the oxygen carrying capacity of the blood. At low concentrations, CO has been shown to aggravate the symptoms of cardiovascular disease. It can cause headaches, nausea, and at sustained high concentration levels, can lead to coma and death.
NO2	When combustion temperatures are extremely high, such as in engines, atmospheric nitrogen gas may combine with oxygen gas to form various oxides of nitrogen. Of these, nitric oxide (NO) and NO2 are the most significant air pollutants. This group of pollutants is generally referred to as NOx. NOx is relatively harmless to humans but quickly converts to NO2. NO2 has been found to be a lung irritant and can lead to respiratory illnesses. Nitrogen oxides, along with VOCs, are also precursors to ozone formation.
O3	O3 is a highly reactive compound of oxygen. At very high concentrations O3 appears blue in color, is a highly unstable gas and is pungent in odor. At ambient concentrations experienced in the Study Area, O3 is colorless and odorless. O3 is not emitted directly into the atmosphere by pollutant sources, but instead is produced by an atmospheric reaction of NOx and VOCs. Generally, this reaction is most favorable during the warmer summer months when sunlight is stronger. Exposure to O3 may impair lung function and cause respiratory difficulties to sensitive populations (for example, persons with asthma, emphysema, or reduced lung capacity).
PM10 and PM2.5	Particulate matter is comprised of small solid particles and liquid droplets. PM10 refers to particulate matter with a nominal aerodynamic diameter of 10 micrometers or less, and PM2.5 refers to particulate matter with an aerodynamic diameter of 2.5 micrometers or less. Particulates can enter the body through the respiratory system. Particulates over 10 micrometers in size are generally captured in the nose and throat and are readily expelled from the body. Particles smaller than 10 micrometers, and especially particles smaller than 2.5 micrometers, can reach the air ducts (bronchi) and the air sacs (alveoli) in the lungs. Particulates are associated with increased incidence of respiratory diseases, cardiopulmonary disease, and cancer.
SO2	SO2 emissions are the main components of the “oxides of sulfur,” a group of highly reactive gases from fossil fuel combustion at power plants, other industrial facilities, industrial processes, and burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment. High concentrations of SO2 will lead to formation of other sulfur oxides. By reducing the SO2 emissions, other forms of sulfur oxides are also expected to decrease. When oxides of sulfur react with other compounds in the atmosphere, small particles that can affect the lungs can be formed. This can lead to respiratory disease and aggravate existing heart disease.
Pb	Pb is a heavy metal that can affect the nervous system, kidneys, immune system, reproductive system and cardiovascular system when exposed to substantial doses. Pb is emitted through some heavy industrial manufacturing processes, especially those associated with metal processing. The addition of Pb to fuel increases engine performance and reduces valve wear; however, general use of Pb as a fuel additive has been phased out for on-road vehicles in the United States. Since this phase out, Pb concentrations in ambient air are often low. States with no significant lead emitting sources typically do not measure Pb at their ambient air monitoring stations.

Table 7-5 presents the background concentrations of pollutants for the Project Area based on air quality monitoring from 2014 to 2016. The table presents concentrations from the closest valid monitoring location to the Project Area. The monitoring location in closest proximity to the Project Area was at Aurora Hills Visitors Center (South 18th and South Hayes Street) in Arlington, Virginia. This monitoring station is representative of an urban scale. As some pollutants are not monitored at Aurora Hills Visitors Center, the closest monitoring stations with available data at McMillan, DC and Fredericksburg, Virginia, were used to supplement the background concentrations.

The representative regional background concentrations show that all pollutant concentrations at the monitor nearest the Study Area are below their respective NAAQS criteria, except ozone. Most of the pollutants have ambient concentrations well below the NAAQS, while PM_{2.5} has measured concentrations approaching the NAAQS. These background concentrations will be added to the project-related pollutant emissions to assess the project-related air quality impacts against the NAAQS.

The Project is located in the District and Arlington County, which have been designated by the EPA as in Marginal Nonattainment for 8-hour ozone inside the Ozone Transport Region. The two regions are Maintenance areas for CO and PM_{2.5}.³¹¹

Table 7-5 | Regional Background Air Quality Concentrations

Pollutant	Averaging Period	Background Concentration	Monitoring Location	NAAQS
CO (ppm)	8-hour	1.7	Aurora Hills Visitor Center, VA	9
	1-hour	3.7	Aurora Hills Visitor Center, VA	35
NO₂ (ppb)	1-hour	50	McMillan, DC	100
	Annual	11	Aurora Hills Visitor Center, VA	53
O₃ (ppm)	8-hour	0.072	Aurora Hills Visitor Center, VA	0.070
PM_{2.5} (µg/m ³)	Annual	8.5	Aurora Hills Visitor Center, VA	12
	24-hour	19	Aurora Hills Visitor Center, VA	35
PM₁₀ (µg/m ³)	24-hour	27	Fredericksburg, VA	150
SO₂ (ppb)	1-hour	11	McMillan, DC	75
Pb (µg/m ³)	3-month	0.01	McMillan, DC	0.15

Source: EPA, Air Quality Design Values (2017) ³¹²
Note: (ppm) – parts per million; (ppb) – parts per billion; (µg/m³) – micrograms per meter cubed

³¹¹ U.S. Environmental Protection Agency (EPA). Undated. Nonattainment Areas for Criteria Pollutants (Green Book). Accessed from <https://www.epa.gov/green-book>. Accessed June 29, 2017.

³¹² EPA. 2017. Virginia Ambient Air Monitoring Data Report. Accessed from <https://www.epa.gov/air-trends/air-quality-design-values>. Accessed November 8, 2017.

7.5.3. Air Quality Index

The Air Quality Index (AQI) is a metric used for metropolitan areas to report on the daily air quality and associated health effects that may result from levels of air pollution. AQI is calculated by the EPA based on five major air pollutants included in the CAA: ground-level O₃, particle pollution, CO, SO₂, and NO₂. The primary focus of the AQI is on O₃ and PM, as these pose the greatest risk to human health.

As shown in **Table 7-6**, the AQI is split linearly into six categories to determine the level of health concern. An AQI of less than 100 is generally considered satisfactory except for particularly sensitive groups. As levels increase they begin to be considered unhealthy for all groups.

Table 7-6 | Air Quality Index and Associated Health Effects

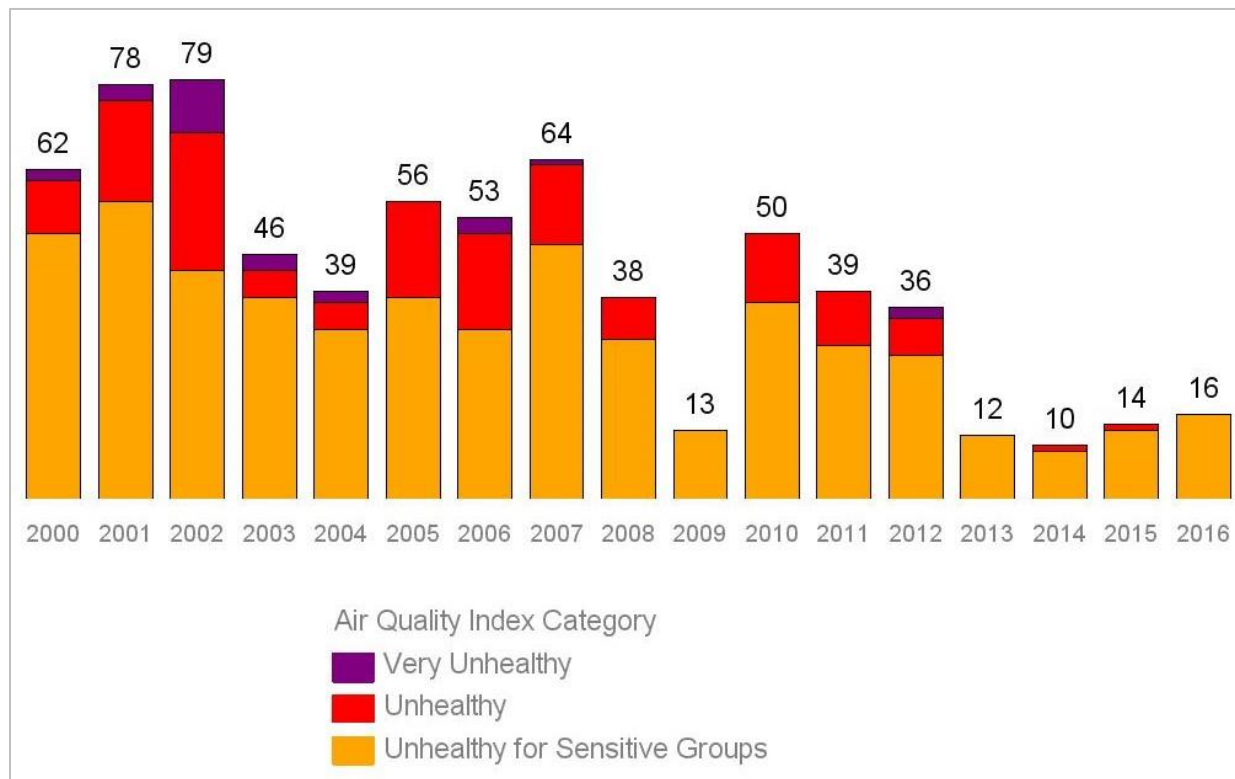
AQI	Level of Health Concern	Health Effects
0 to 50	Good	Air quality is considered satisfactory, and air pollution poses little or no risk
51 to 100	Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution
101 to 150	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects; the general public is not likely to be affected
151 to 200	Unhealthy	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects
201 to 300	Very Unhealthy	Health alert; everyone may experience more serious health effects
301 to 500	Hazardous	Health warnings of emergency conditions; the entire population is more likely to be affected

Source: EPA, 2018³¹³

The AQI for the Long Bridge Project is determined based on the Aurora Hills Visitor Center air quality monitoring location. **Figure 7-4** shows the number of days per year where the AQI reached levels unhealthy for sensitive groups or above for the combined pollutants ozone and PM 2.5 for the District, Arlington, and Alexandria areas. In the Project Area, the AQI is generally good to moderate, with trends toward improved air quality in the last 15 years.

³¹³ EPA. May 2016. Technical Assistance Document for the Report of Daily Air Quality – the Air Quality Index (AQI). Accessed from <https://www3.epa.gov/airnow/aqi-technical-assistance-document-may2016.pdf>. Accessed January 17, 2018.

Figure 7-4 | Number of Days Reaching Unhealthy for Sensitive Groups on the Air Quality Index for Combined Ozone and PM2.5



Note: Data representative of the DC region

Source: EPA, 2018.³¹⁴

³¹⁴ EPA. AQI Trends – Combined Ozone/PM2.5. Accessed from https://gispub.epa.gov/OAR_OAQPS/SeasonReview2016/index.html?appid=c14363d1de994f06960c9d9b7ad84540. Accessed January 17, 2018.

8.0 Greenhouse Gas Emissions and Resilience

8.1. Overview

This section identifies regulatory requirements for greenhouse gas (GHG) emissions and resilience impacts set forth by the U.S. Environmental Protection Agency (EPA) and other applicable regulatory agencies. The section also discusses the existing conditions of GHG emissions and climate resiliency for the Long Bridge Project. GHGs are gases that trap heat in the atmosphere. Pollutants that are considered GHGs affect air quality and climate change. Some major GHGs include:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)
- Fluorinated gases (hydrofluorocarbons, perfluorocarbons, etc.)

The precise sources of these pollutants, their effects on human health and general welfare, and their final disposition in the atmosphere vary considerably.

Energy resources are a major source of GHGs and are important for the nation's economy. Forms of energy used in the United States include electricity, natural gas, and liquid fuels such as gasoline, diesel, fuel oil, heating oil, and propane. Electricity is often generated by burning natural gas, coal, or fuel oil, each of which results in GHG emissions, but can also be generated using the sun, wind, flowing and running water, nuclear power, and other sources that offer a no or low GHG emissions alternative. Fuel oils can also be used to heat and cool water, spaces, or other substances in residential, commercial or industrial applications, resulting in GHG emissions. Even the process of manufacturing fuels can result in significant emissions of GHGs, since refining petroleum or crude oil into other petroleum products such as fuel oil, heating oil, gasoline, diesel, and propane requires burning fuels.

In recent years, the DC region has experienced an increasing number of impacts from changing climate conditions, such as record-breaking heat waves and snowstorms, flooding, and heavy rain storms.³¹⁵ This section reviews the existing and anticipated changing climate conditions (by which the Project may be affected), including rising temperature, changing precipitation patterns, sea level rise, and frequency and intensity of extreme weather events.

8.2. Regulatory Context

The following laws, regulations, and agency jurisdiction and management guidance are pertinent to GHG emissions and resilience resources. Key regulations and guidance that are most relevant to the Project are listed below.

The U.S. Department of Transportation (USDOT) lays out five strategic goals for America's transportation system in its latest Strategic Plan: Safety; State of Good Repair; Economic Competitiveness; Livable

³¹⁵ District Department of Energy and the Environment. Undated. Climate Ready DC: The District of Columbia's Plan to Adapt to a Changing Climate. Accessed from <https://doee.dc.gov/climate-ready>. Accessed June 4, 2018.

Communities; and Environmental Sustainability. With regards to environmental sustainability, USDOT cites the need to improve the energy and environmental performance of the transportation sector.

8.2.1. Greenhouse Gas Emissions and Resilience Federal Laws, Regulations, and Other Guidance

There are no established thresholds for assessing the significance of a project's GHG emissions; instead, the analysis seeks to identify GHG sources and practicable means to reduce them. The following list of executive orders and regulatory documents guide the assessment of GHG and resiliency.

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- EO 13783 of March 28, 2017: Promoting Energy Independence and Economic Growth, which rescinds EO 13653 and CEQ Final GHG Guidance (withdrawn)
- EO 13677 of September 23, 2014: Climate Resilient International Development
- EPA and USDOT Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards (2011)^{316,317}
- Public Law 110-140 Energy Independence and Security Act (EISA) of 2007³¹⁸

Relevant Federal Guidance:

- EPA Greenhouse Gas Endangerment Finding (2009)³¹⁹

8.2.2. Greenhouse Gas Emissions and Resilience State and Local Laws, Regulations, and Other Guidance

Relevant State and Local Laws and Regulations:

- There are no relevant state and local laws or regulations for this resource.

³¹⁶ 75 FR 25324

³¹⁷ 77 FR 62624

³¹⁸ Public Law 110-140

³¹⁹ 74 FR 66495

Relevant State and Local Guidance:

Several plans have been developed for the areas that provide guidance and direction. The Commonwealth of Virginia has developed plans to reach GHG reduction goals and sustainability objectives; the Virginia Energy Plan aims increase the share of renewable energy sources in the Commonwealth's energy portfolio.³²⁰ The District has developed multiple plans to reach its GHG reduction goals and sustainability objectives, including the Sustainable DC Plan and the Climate Ready DC Plan.^{321,322} The District is targeting GHG reduction goals of 50 percent by 2032 and 80 percent by 2050.³²³ The District recognizes the need to enhance its resilience, in order to prepare for and adapt to potential future climate impacts. By 2032, any new building and major infrastructure project will undergo a climate change impact assessment as part of the regulatory planning process

8.3. Study Area

Climate change is a global phenomenon with localized implications—existing conditions for discussion of contributions to GHG emissions is characterized using a Regional Study Area for mobile sources. For stationary sources, a more Local Study Area is required. The effects of climate change on the Project (for example, extreme heat days or more frequent and intense heavy rain events) will be considered at both regional and local levels. The effects of energy use are also global and local, as the GHG emissions released in the electricity generation sector and extraction and refining industry contribute to global GHG emissions and climate change, while local heating and cooling needs fueled with petroleum-based fuels result in local air quality issues.

The Local Study Area includes Long Bridge and the immediate property. The state of dispersion science and health effects of GHG emissions have not sufficiently advanced to accurately consider this resource area at a microscale level from a mobile source perspective. For this reason, the EIS will not consider a Local Study Area for GHG emissions for mobile sources. The Local Study Area for existing conditions and anticipated climate change impacts include the Project Area and the surrounding area within 0.5 miles in which impacts from climate, such as heatwaves, flooding, and extreme storm events, could occur, as shown in **Figure 8-1**.

GHGs are unique from other resource areas and topics considered in the EIS in that the concerns about GHG emissions are primarily related to climate change, which is regional and global in nature. This analysis considers the Study Area for GHGs for mobile sources only on a regional scale. For the Project, the Regional Study Area will be defined as the area that encompasses the jurisdictions of the Metropolitan Washington Council of Governments (MWCOG), the local Metropolitan Planning Organization (MPO) in Maryland, the District, and Virginia. The Regional Study Area is shown in **Figure 8-2**.

³²⁰ Department of Mines, Minerals, and Energy, Commonwealth of Virginia. Undated. The Virginia Energy Plan. October 1, 2014. DOEE, District Office of Planning (DCOP), and Office of the Mayor. 2016. The Sustainable DC Plan. Accessed from http://www.sustainabledc.org/wp-content/uploads/2017/03/SDC_Plan_2016_compressed2.pdf. Accessed June 8, 2017.

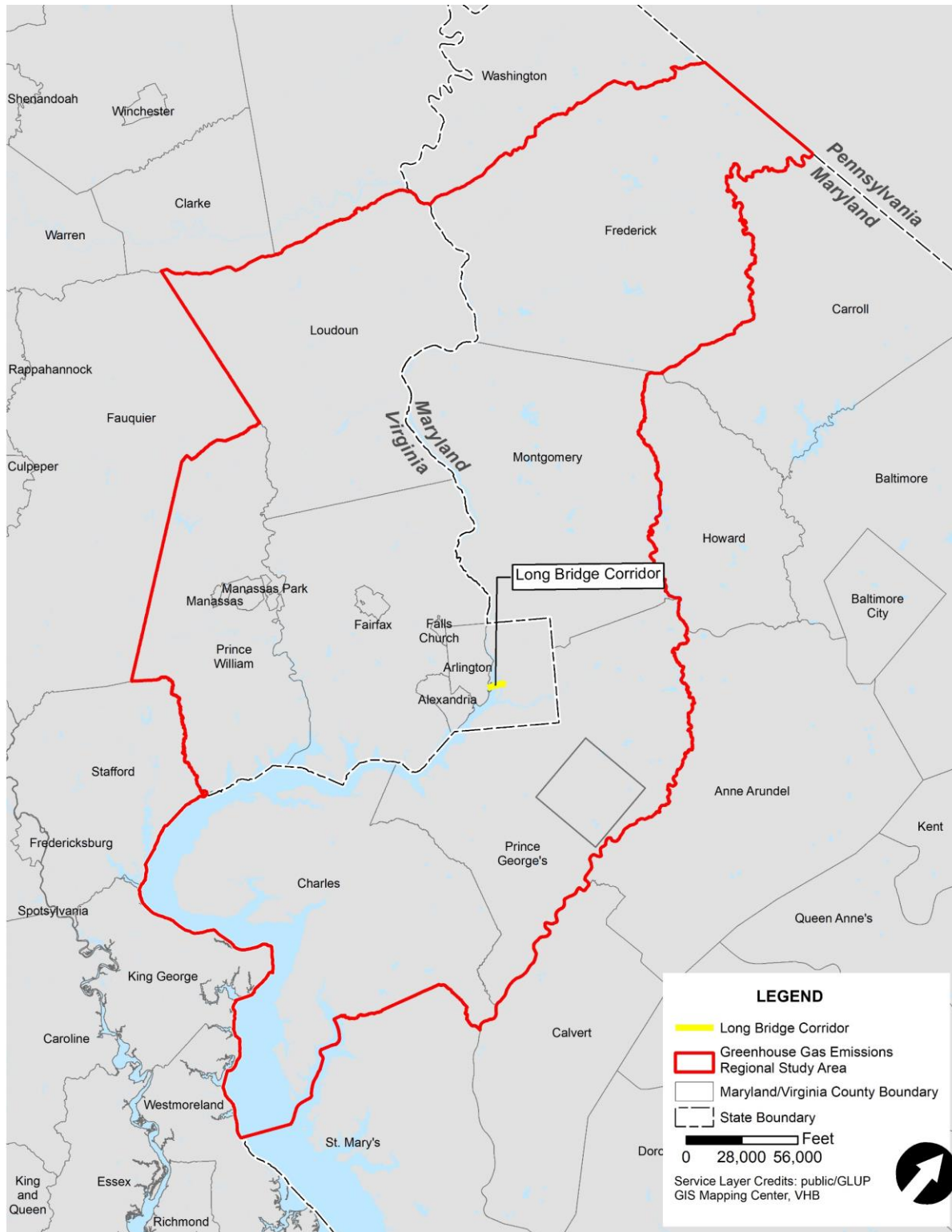
³²² Climate Ready DC: The District of Columbia's Plan to Adapt to a Changing Climate. Undated.

³²³ DOEE, District Office of Planning (DCOP), and Office of the Mayor. 2016. The Sustainable DC Plan. Accessed from http://www.sustainabledc.org/wp-content/uploads/2017/03/SDC_Plan_2016_compressed2.pdf. Accessed June 8, 2017.

Figure 8-1 | Local Study Area for GHG and Resilience



Figure 8-2 | Regional Study Area for GHG and Resilience



The Project's Regional Study Area will assess existing and anticipated climate conditions at various scales, based on the referenced reports and publications. For example, while the U.S. Third National Climate Assessment (NCA) provides data for the Northeast region,³²⁴ the National Oceanic and Atmospheric Administration's (NOAA's) State Climate Summaries provide more localized data for the District.³²⁵ The Climate Ready DC Plan also provides localized data for the District.³²⁶

8.4. Methodology

The discussion of global, national, and regional trends in GHG emissions and resilience relies on the following primary sources, and others as appropriate:

Data sources include:

- International Energy Agency analyses and projections of global energy use;
- IPCC, 5th Assessment Report³²⁷ and other reports. Current global assessment of climate change including scientific information on causes of climate change, GHG emissions, and projections of impacts;
- NOAA and Oak Ridge National Laboratory, Recent Greenhouse Gas Concentrations;³²⁸
- U.S. Energy Information Administration, Annual Energy Outlook.³²⁹ Assessment of GHG emissions and projects based on energy sectors;
- U.S. Global Change Research Program, U.S. National Climate Assessment.³³⁰ Assessment of climate change and potential impacts in the United States, including potential climate change impacts by region;
- EPA, U.S. Greenhouse Gas Inventory.³³¹ Assessment of GHG emissions in the United States and trends by GHGs and economic sector;

³²⁴ Horton, R., G. Yohe, W. Easterling, R. Kates, M. Ruth, E. Sussman, A. Whelchel, D. Wolfe, and F. Lipschultz, 2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 16-1-nn.

³²⁵ Runkle, J., K. Kunkel, D. Easterling, B. Stewart, S. Champion, R. Frankson, and W. Sweet, 2017: Maryland State Summary. NOAA Technical Report NESDIS 149-MD, 4 pp.

³²⁶ Climate Ready DC: The District of Columbia's Plan to Adapt to a Changing Climate. Undated.

³²⁷ Intergovernmental Panel on Climate Change (IPCC), September 2013 to November 2014, *Intergovernmental Panel on Climate Change, 5th Assessment Report (AR5)*, <http://www.ipcc.ch/activities/activities.shtml>. Accessed June 6, 2017.

³²⁸ Blasing, T.J. Oak Ridge National Laboratory. April 2016. *Recent Greenhouse Gas Concentrations*. http://cdiac.ornl.gov/pns/current_ghg.html. Accessed June 6, 2017.

³²⁹ U.S. Energy Information Administration. January 5, 2017. *Annual Energy Outlook 2017*. [https://www.eia.gov/outlooks/aeo/pdf/0383\(2017\).pdf](https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf). Accessed June 8, 2017.

³³⁰ U.S. National Climate Assessment, U.S. Global Change Research Program. 2014. *Climate Change Impacts in the United States*. <http://www.globalchange.gov/browse/reports/climate-change-impacts-united-states-third-national-climate-assessment-0>. Accessed June 8, 2017.

³³¹ U.S. Environmental Protection Agency. 2017. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015*. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>. Accessed June 8, 2017.

- DC Department of Energy and Environment (DOEE), District of Columbia Greenhouse Gas Inventory;³³²
- DOEE Climate Ready DC Plan and supporting technical documents;
- DOEE Climate Projections & Scenario Development, Climate Change Adaptation Plan for the District of Columbia;³³³
- The Virginia Energy Plan, Energy plan to increase renewable energy reduction and reduce GHG emissions by 30 percent in 2025; and
- Arlington County's Community Energy Plan. Energy plan to increase local renewable energy reduction and reduce carbon footprint 75 percent by 2050.

The Affected Environment summarizes the baseline GHG emissions and climate change information for the Local and Regional Study Areas and regional trends. Since GHG and climate change are inherently regional issues, the existing conditions of this resource are established on a regional scale. The Affected Environment is defined based on evaluation of global, national, and regional trends. Existing climate change effects are described on a local and regional scale.

Global, national, and regional trends in GHG emissions and climatic changes are used to characterize the Affected Environment. Existing GHG emissions associated with the mobile sources are characterized using a methodology described in **Section 7.0, Air Quality**.

The Affected Environment discussion also provides context for the evaluation of potential climate change effects on the Project. Existing climate change effects are described and provide the baseline for assessing future climate change effects on the Project.

8.5. Affected Environment

This section summarizes the affected environment based on the evaluation of current GHG emission, climate conditions, and energy use, and provides context for assessing the potential implications on the Project. Current climate change conditions (primarily temperature, precipitation, and sea level rise) will be reviewed on both local and regional scales. In addition, the analysis quantifies the GHG emissions related to the operations and maintenance of the existing bridge, as well as its current energy use and the sources of that energy.

8.5.1. Regional Greenhouse Gas and Climate Resiliency

Regional climate and meteorological conditions can substantially affect air quality across the region. Emission, transport, and dispersion of pollutants are highly dependent on wind speed, wind direction, air temperature, precipitation, humidity, and other meteorological factors. Generally, the District and the Study Area are characterized as a humid subtropical climate. This category typically experiences hot

³³² DC Department of Energy and Environment. *Greenhouse Gas Inventories*. <https://doee.dc.gov/service/greenhouse-gas-inventories>. Accessed June 8, 2017.

³³³ DC Department of Energy and Environment. June 2015. *Climate Projections & Scenario Development, Climate Change Adaptation Plan for the District of Columbia*. <https://doee.dc.gov/publication/climate-projections-scenario-development>. Accessed June 8, 2017

and humid summers, cold winters with light snowfall, and annual precipitation occurring throughout the year.

Detailed information on changing climate conditions and the resulting impacts to human, natural, and built infrastructure systems is summarized in reference documents such as the Intergovernmental Panel on Climate Change's (IPCC's) latest synthesis report, the U.S. Third National Climate Assessment, and Climate Ready DC.^{334,335}

When fossil fuels like coal, oil, and natural gas are burned, carbon dioxide is added to the atmosphere, where it builds up and traps heat. The increased warming of temperatures affects global ocean currents and weather, resulting in increased frequency and strength of extreme weather events, heat-related illnesses, and worsened air quality. In the DC region, there has already been a rise in average annual temperature and sea level in the Potomac River and these trends are expected to continue.³³⁶ The region has met its 2012 goal to reduce greenhouse gas emissions to 2005 levels. The MWCOG continues to work with its regional partners to meet the 2020 goal of 20 percent below 2005 levels.³³⁷

The District Department of Energy and Environment (DOEE) regularly tracks the District's GHG emissions to determine the region's compliance with its reduction goals. The most recent iteration of the GHG inventory estimates that approximately 57 percent of the District's GHG emissions are from non-residential buildings, followed by 23 percent in the transportation sector. When the inventory was conducted in 2013, the city-wide annual GHG emissions were 7.75 million metric tons of CO₂e; however, this represented an annual GHG emission reduction of 2.35 million metric tons of CO₂e when compared to the base year emissions in 2006. The fuel source contributing most to these emissions is electricity consumption, followed by natural gas and gasoline. A majority of transportation-related GHG emissions were produced by passenger vehicles, while electricity used in transit only accounted for 6 percent of transportation-related GHG emissions.

According to the Third National Climate Assessment, the Northeast region has recorded an increase in average annual temperature by almost 2 degrees Fahrenheit and an increase in annual precipitation of approximately 5 inches. It is also reported that the Northeast has been experiencing a 70 percent increase in precipitation volume during extreme storm events, a much higher rate of increase compared to other regions in the U.S. By mid-century, the majority of the Northeast region's southern portion, of which the District is a part, is projected to experience more days per year above 90 degrees Fahrenheit. With regard to precipitation, the frequency and intensity of heavy downpours is increasing, particularly in the winter and spring seasons, a trend likely to continue to increase through the end of the century. Additionally, sea level in the Northeast region has risen approximately 1 foot on average since 1990—exceeding the global average of 8 inches—and resulted in increasing coastal flooding in the region. Sea

³³⁴ IPCC. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. 2014.

³³⁵ Climate Ready DC: The District of Columbia's Plan to Adapt to a Changing Climate.

³³⁶ Metropolitan Washington Council of Governments (MWCOG). Undated. Environment Climate & Energy. Accessed from <https://www.mwco.org/environment/planning-areas/climate-and-energy/>. Accessed May 3, 2018.

³³⁷ MWCOG. Environment Climate & Energy. Undated.

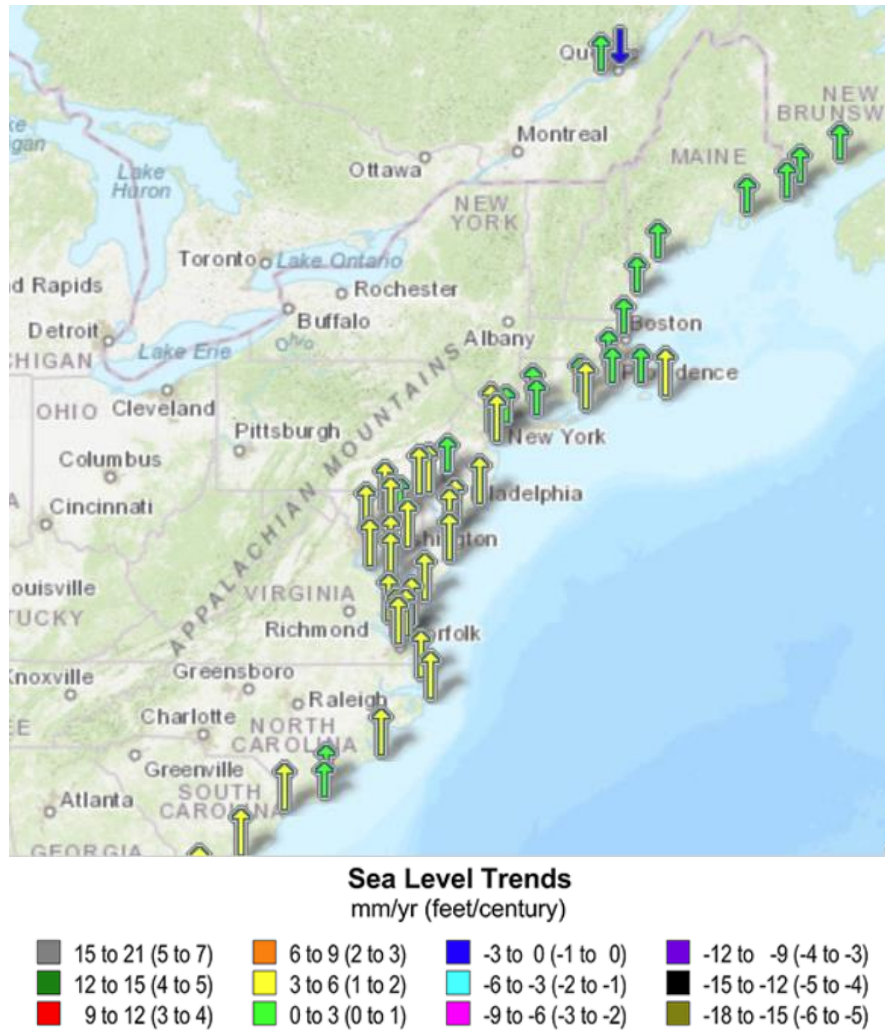
level rise is expected to continue rising at a more rapid rate than global average, due to local land subsidence, and will pose a major threat as it will intensify the impacts of coastal flooding.³³⁸ **Figure 8-3** demonstrates the Northeast sea level trends and magnitude of changes.

More specifically to the District area, the average annual temperature has increased by approximately 2 degrees Fahrenheit during the last 50 years. In fact, the District has reportedly experienced five of the six hottest summers on record since 2010. On average, the District area experiences about 30 days of dangerous hot days (when temperature is 95 degrees Fahrenheit or above) per year. Heatwaves are also a concern for the area, with the most recent incident in 2012, when the District hit a record-breaking heatwave of temperatures above 95 degrees Fahrenheit for 11 consecutive days. As average temperature is projected to continue rising, the District is expected to experience hot days and heatwaves more frequently. **Figure 8-4** demonstrates the current and projected increase in numbers of extremely hot days which would require the District to activate its heat emergency plan. As for precipitation patterns, while annual precipitation volumes have not changed significantly, it is reported that more precipitation has been occurring in the fall and winter and less in the summer in the District area. Extreme precipitation events are also expected to occur more frequently and intensely by the middle to the end of the century as well. **Figure 8-5** shows the significant changes in frequency of extreme rain events; as noted, what is considered as today's 100-year precipitation event will likely become a 25-year event by mid-century.³³⁹

³³⁸ Horton, R., G. Yohe, W. Easterling, R. Kates, M. Ruth, E. Sussman, A. Whelchel, D. Wolfe, and F. Lipschultz, Climate Change Impacts in the United States: The Third National Climate Assessment.

³³⁹ DOEE. Climate Ready DC: The District of Columbia's Plan to Adapt to a Changing Climate.

Figure 8-3 | Regional Trends in Sea Level and Magnitude of Changes in the Northeast



Source: NOAA

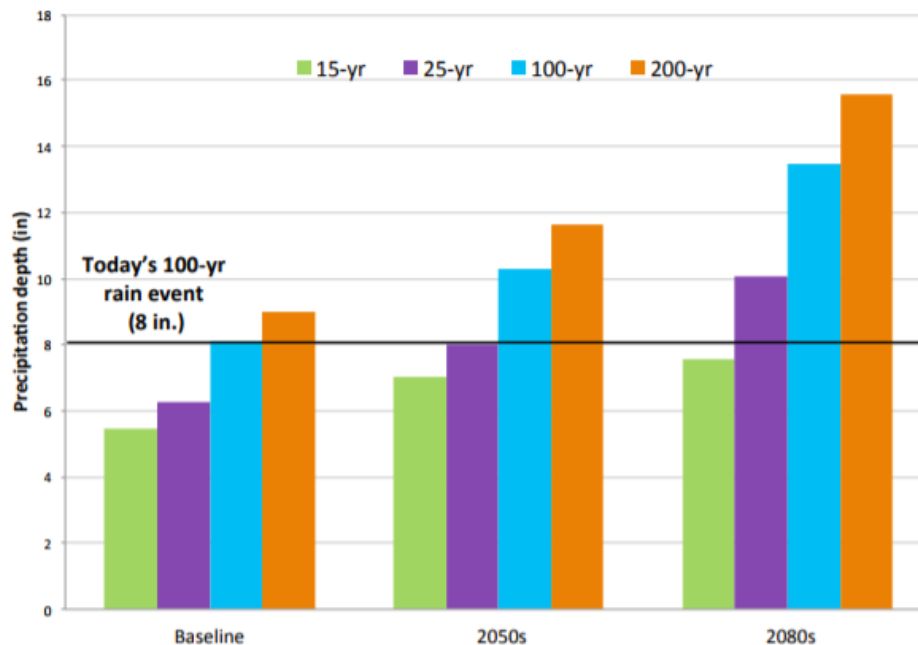
Figure 8-4 | Current and Projected Number of Dangerously Hot and Heat Emergency Days Per Year in the District



Source: *Climate Ready DC: The District of Columbia's Plan to Adapt to a Changing Climate*³⁴⁰

³⁴⁰ DOEE. Climate Ready DC: The District of Columbia's Plan to Adapt to a Changing Climate.

Figure 8-5 | Current and Projected Extreme Precipitation Events in the District



Source: *Climate Ready DC: The District of Columbia's Plan to Adapt to a Changing Climate*³⁴¹

With regard to sea level rise, water levels of both the Potomac and Anacostia Rivers have reportedly risen 11 inches in the past 90 years, which resulted in 300 percent increase of flooding along the riverfront areas.³⁴² Similarly, according to the EPA report *What Climate Change Means for the District of Columbia*, as the land along the shores of Potomac and Anacostia Rivers sink, sea level will rise at a more rapid rate. As a result, extreme high tides may reach farther inland. Overall, the District's sea level is expected to rise between 16 inches and 4 feet in the next century.³⁴³

Climate change will also make the District more vulnerable to storm surge flooding from coastal storms and hurricanes.

³⁴¹ DOEE. *Climate Ready DC: The District of Columbia's Plan to Adapt to a Changing Climate*.

³⁴² DOEE. *Climate Ready DC: The District of Columbia's Plan to Adapt to a Changing Climate*.

³⁴³ EPA. November 2016. *Climate Change Indicators in the United States: What Climate Change Means for the District of Columbia*. Accessed from <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100Q5CG.PDF?Dockkey=P100Q5CG.PDF>. Accessed November 22, 2017.

Figure 8-6 and **Figure 8-7** illustrate Sea, Lake and Overland Surges from Hurricanes (SLOSH) models of current (**Figure 8-6**) and projected (**Figure 8-7**) storm surge in the District and Virginia for Category 1, Category 2, and Category 3 hurricanes.³⁴⁴

³⁴⁴ DOEE. Undated. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/150828_AREA_Research_Report_Small.pdf. Accessed December 4, 2017.

Figure 8-6 | SLOSH Modeling Results for Storm Surge in Present Days Under Category 1, Category 2, and Category 3 Hurricanes

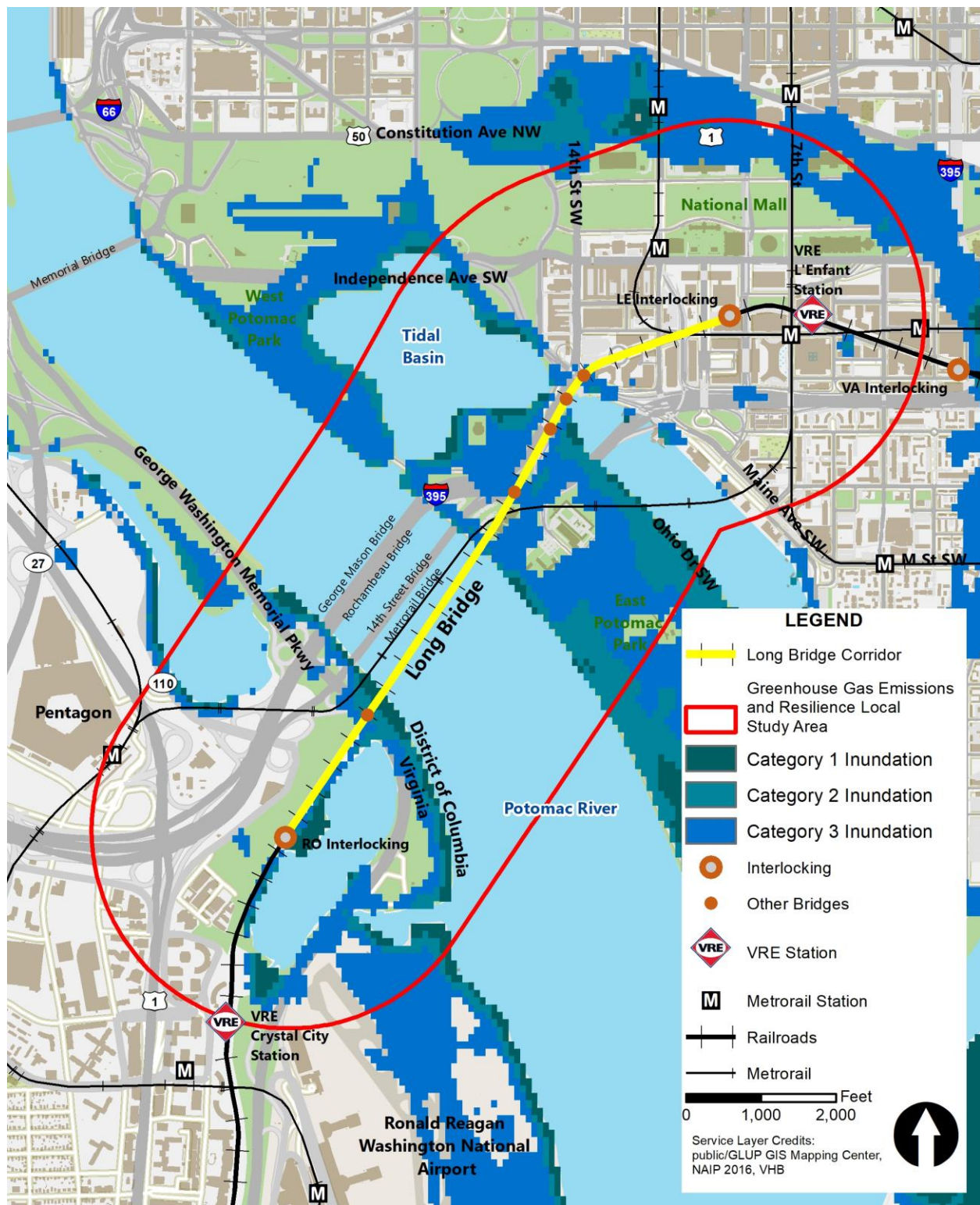
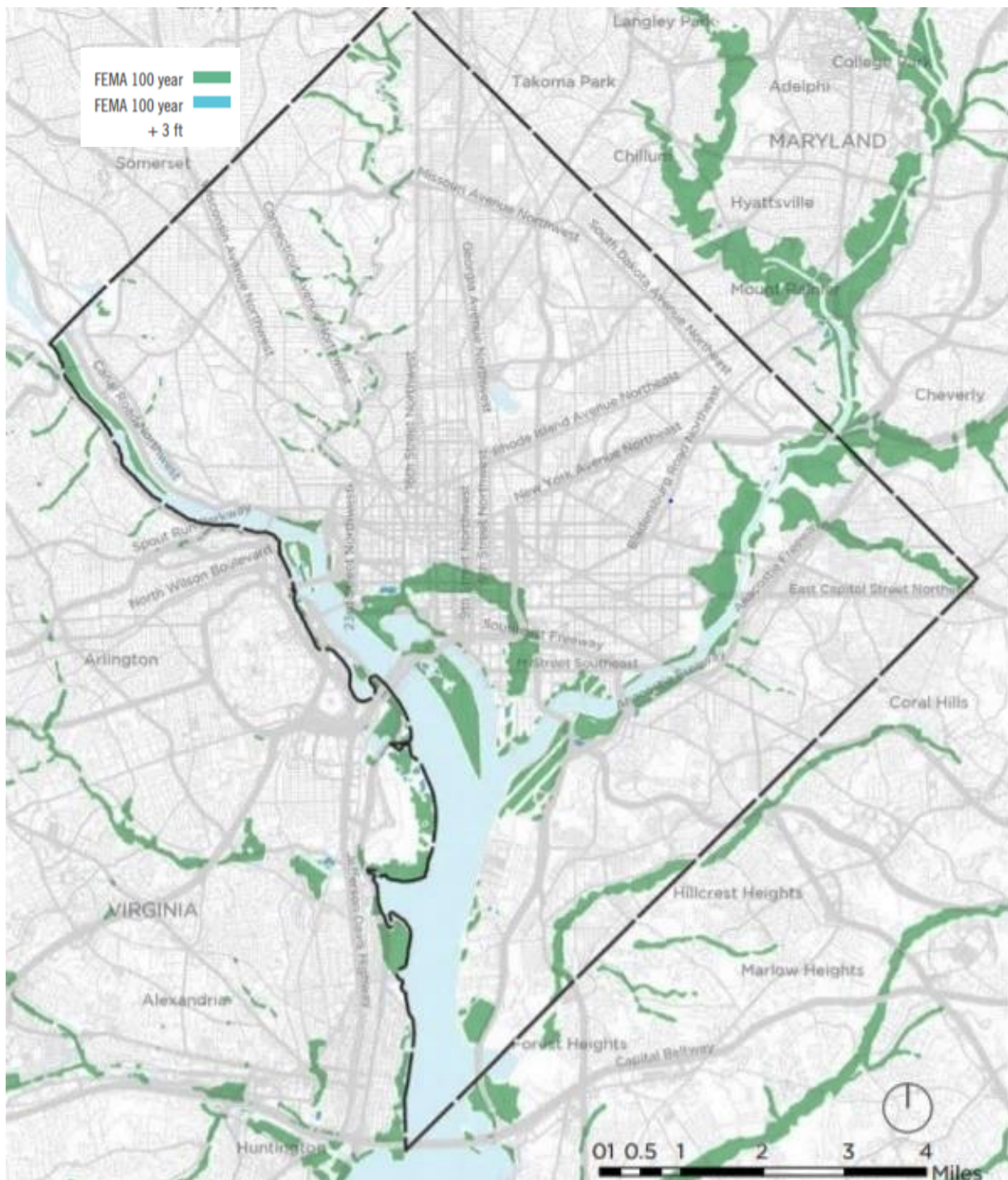


Figure 8-7 | SLOSH Modeling Results for FEMA 100-Year Flood Plus 3-Foot Sea Level Rise Projection (by End of Century)



Source: NACCS, 2015. Retrieved from *Climate Ready DC: Climate Projections and Scenarios Development Technical Report*.

As noted in Climate Ready DC Plan, “energy, transportation, water, and communication systems are essential to keeping the city running ... Ensuring the resilience of these systems to future changes in climate is a priority.”³⁴⁵ Overall, the District remains committed to reducing its contribution to climate change by cutting GHG emissions by 50 percent by 2032 and 80 percent by 2050.³⁴⁶ In addition, the MWCOG facilitates regional coordination on climate adaptation. The National Capital Planning Commission (NCPC) supports Federal and local agency collaboration on climate change.

³⁴⁵ DOEE. Climate Ready DC: The District of Columbia’s Plan to Adapt to a Changing Climate.

³⁴⁶ DOEE. Climate Ready DC: The District of Columbia’s Plan to Adapt to a Changing Climate.

9.0 Energy Resources

9.1. Overview

Energy is an important resource for the nation's economy, and the conservation of energy is vital to the U.S. Department of Transportation (USDOT) goals of environmental sustainability, clean air, and the reduction of greenhouse gases (GHG). Energy use, as it is discussed in this section, is divided into operational and construction energy consumption.

Operational energy consumption is defined, for this project, to be a function of the following operational characteristics:

- The operational energy used by the bridge itself including lighting, transportation sensors, communications equipment, and other related energy-consuming train and bridge equipment.
 - Energy sources considered include electricity, and fuels (if applicable) such as natural gas, gasoline, diesel fuel and propane.
- The energy required to maintain the bridge.

Construction energy consumption consists of the non-recoverable, one-time energy expenditures associated with the construction of the physical infrastructure associated with a project. The energy considered in an analysis of energy consumption includes electricity, and fuels (if applicable) such as natural gas, gasoline, diesel fuel, and propane. Fuel use includes use related to construction vehicles, construction equipment, and mobile generators used on the construction site.

9.2. Regulatory Context

9.2.1. Energy Resources Federal Laws, Regulations, and Other Guidance

The Council of Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) require consideration of energy efficiency.

Several executive orders (EOs) and laws have been promulgated over the years that require or promote the consideration of energy efficiency in Federal actions.

Relevant Federal Laws, Regulations, and EOs:

- EO 13211 of May 18, 2001, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use³⁴⁷
- EO 13783 of March 28, 2017, Promoting Energy Independence and Economic Growth³⁴⁸

³⁴⁷ 66 FR 28355

³⁴⁸ 82 FR 16093

- EISA 2007³⁴⁹
- Sections of 42 USC address energy conservation, decreased dependence on foreign oil, the use of alternative fuels, and increased efficiency in energy use (such as improved gas mileage in motor vehicles)
 - Chapter 71, Solar Energy
 - Chapter 73, Development of Energy Resources
 - Chapter 74, Nonnuclear Energy Research and Development
 - Chapter 77, Energy Conservation
 - Chapter 81, Energy Conservation and Resource Renewal
 - Chapter 91, National Energy Conservation Policy
 - Chapter 96, Biomass Energy and Alcohol Fuels
 - Chapter 100, Wind Energy Systems
 - Chapter 149, National Energy Policy and Programs
 - Chapter 152, Energy Independence and Security

Relevant Federal Guidance:

Five strategic goals for America's transportation system are laid out in USDOT's latest Strategic Plan: Safety; State of Good Repair; Economic Competitiveness; Livable Communities; and Environmental Sustainability. With regards to environmental sustainability, USDOT cites the need to improve the energy and environmental performance of the transportation sector.

9.2.2. Energy Resources State and Local Laws and Regulations

- Building Energy Code for the District of Columbia, 2012 IECC with Amendments, includes the DC Energy Conservation Code as the code applies to the construction of buildings and structures.³⁵⁰
- *Sustainable DC Initiative* is Washington, DC's overarching sustainability framework and includes municipal operations' greenhouse gas reduction and energy savings goals. The initiative describes strategies for various policy areas including energy, climate and environment, transportation, and the built environment.³⁵¹
- The Commonwealth of Virginia has developed plans to reach sustainability objectives such as The Virginia Energy Plan.³⁵²
- Arlington County Community Energy Plan³⁵³ to reduce GHG emissions.

³⁴⁹ Energy Independence and Security Act of 2007. Accessed from <https://www.congress.gov/bill/110th-congress/house-bill/6>. Accessed on December 14, 2017.

³⁵⁰ U.S. Department of Energy, Energy Efficiency and Renewable Energy, Building Energy Codes Program, Washington, DC. Undated. The DC Energy Conservation Code. <http://www.energycodes.gov/adoption/states/washington-dc>. Accessed June 29, 2017.

³⁵¹ Washington DC City Government, DC.Gov. Undated. Sustainable DC Initiative. <https://sustainable.dc.gov/>. Accessed June 29, 2017.

³⁵² "The Virginia Energy Plan" *Department of Mines, Minerals, and Energy, Commonwealth of Virginia*. October 1, 2014.

³⁵³ "Community Energy Plan" *Arlington County, Virginia*. June, 2013.

9.3. Study Area

The Local Study Area includes the area within 0.5 miles of the Project Area as displayed in **Figure 9-1**.

The Regional Study Area includes the entire Pennsylvania, Jersey, Maryland Power Pool “PJM Interconnection” service area as displayed in **Figure 9-2**. Electricity used on the bridge is sourced from generation stations that supply the local utility, Pepco, and feed the local distribution system and the bridge. These generation stations can be located throughout the PJM service area and beyond. PJM is the regional transmission operator (RTO), which schedules and dispatches electric generators each day to meet the electricity demands for the utilities in its service area. This service area includes all or part of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.

9.4. Methodology

This section assesses energy resources used on the existing Long Bridge and the magnitude of the consumption of energy resources on the bridge. The Affected Environment section describes the existing 2017 direct energy use profile. The assumptions on the energy consumption of the existing bridge are based on observation of the energy consuming equipment on the bridge of which there is very little.

9.5. Affected Environment

The bridge infrastructure in the Local Study Area has a minimal impact on consumption of energy resources due to the minimal amount of energy consuming equipment on the bridge. Currently, 76 trains per day travel through the corridor and over the Long Bridge. Of these, 58 are passenger trains and 18 are freight trains. In the No Action Alternative, the number of total trains per day will rise to 112 and in the 2040 Planned scenario 192 trains per day are expected to travel in the corridor and over the bridge. The additional energy consumption from the additional trains will create the largest permanent impact on consumption of energy resources in the form of diesel fuel consumption. The consumption of energy on the bridge from bridge equipment is so low that it does not warrant inclusion in the documentation of the affected environment whereas the energy consumed by the trains represents a quantifiable impact. The GHG emissions impact of the energy consumed by the trains is addressed in greater detail in the **Section 8.0, Greenhouse Gas and Resiliency**.

The Regional Study Area in the PJM Service area had a total electrical load of 88,601 megawatt hours (MWh) in 2016.³⁵⁴ PJM is one of ten RTOs in North America, which together manage 60 percent of the electricity used in the United States.³⁵⁵

³⁵⁴ 2016 State of the Market Report for PJM. <http://www.pjm.com/~media/committees-groups/committees/mc/20170323-state-of-market-report-review/20170323-2016-state-of-the-market-report-for-pjm.ashx>. Accessed June 7, 2018

³⁵⁵ U.S. Energy Information Administration. April 4, 2011. Today in Energy: About 60% of the U.S. electric power supply is managed by RTOs. <https://www.eia.gov/todayinenergy/detail.php?id=790>. Accessed June 7, 2018.

Figure 9-1 | Energy Resources Local Study Area



Figure 9-2 | Regional Study Area



10.0 Land Use and Property

10.1. Overview and Definitions

This section of the Environmental Impact Statement (EIS) describes the affected environment as it pertains to existing land use, zoning, and property ownership for an area that generally encompasses land within 0.5 miles of the Project Area as well as selected additional areas of important or sensitive land uses in the District and Arlington County, Virginia.

The following definitions apply to this analysis:

- **Land use** is characterized by the arrangements, activities, and inputs people undertake in a certain land cover type to produce, change, or maintain it.³⁵⁶ Land use, maintained and determined by local agencies, focuses on a property-specific level of detail and is specific to each parcel. Examples of typical land uses include residential and commercial development, transportation planning, resource management, and agricultural lands.
- **Land cover** is the observed physical cover on the earth's surface.³⁵⁷ Land cover provides a high-level classification of general characteristics of a given area, and is classified by remote sensing data through the U.S. Geological Survey (USGS).
- In the course of implementing a specific project, properties or businesses may need to be acquired as a result of the Project, resulting in displacements. In such cases, the term **displacement** is used to represent property acquisition of a parcel or structure(s), while the term **relocation** is used to represent the act of finding new properties for displaced residents, businesses, and organizations.

Applicable plans and policies affecting future land use decisions are described in **Section 10.2, Regulatory Context and Guidance**, and in **Section 10.4.4, Planned Future Land Use**.

10.2. Regulatory Context and Guidance

The following laws, regulations, agency jurisdictions, and guidance are pertinent to land use and property resources. Key regulations and guidance that are most relevant to the Long Bridge Project are listed below.

³⁵⁶ Natural Resources Management and Environment Department. Undated. Land Cover Classification System (LCCS). Accessed from <http://www.fao.org/docrep/003/X0596E/x0596e01e.htm>. Accessed May 3, 2018.

³⁵⁷ Multi-Resolution Land Characteristics Consortium. 2011. National Land Cover Database 2011. Accessed from http://www.mrlc.gov/nlcd11_leg.php. Accessed May 3, 2018.

10.2.1. Land Use and Property Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- Uniform Relocation Assistance and Real Property Acquisition Policies Act (URAA) of 1970³⁵⁸
- Federal Land Policy and Management Act of 1976 (FLPMA)³⁵⁹

Relevant Federal Guidance:

- National Capital Planning Commission (NCPC) Comprehensive Plan for the National Capital – Federal Elements (2016)³⁶⁰
- NCPC Southwest Ecodistrict Plan (2013)³⁶¹
- NCPC Monumental Core Framework Plan (2009)³⁶²
- National Park Service (NPS), National Environmental Policy Act (NEPA) Handbook (2015)³⁶³
- NPS, National Mall Plan (2010)³⁶⁴

10.2.2. Land Use and Property State and Local Laws, Regulations, and Other Guidance

Relevant State and Local Laws and Regulations:

- Commonwealth of Virginia, Code of Virginia, §15.2, Chapter 22: Planning, Subdivision of Land and Zoning³⁶⁵
- District of Columbia, DCMR, Title 11, Zoning Regulations of 2016³⁶⁶

³⁵⁸ 49 CFR 24

³⁵⁹ 43 USC 1701

³⁶⁰ National Capital Planning Commission (NCPC). 2016. Comprehensive Plan for the National Capital-Federal Elements. Accessed from <https://www.ncpc.gov/plans/compplan/>. Accessed May 10, 2018.

³⁶¹ NCPC. 2013. Southwest Ecodistrict Plan. Accessed from <https://www.ncpc.gov/initiatives/swecodistrict/>. Accessed January 12, 2018.

³⁶² NCPC. 2009. Monumental Core Framework Plan. Accessed from <https://www.ncpc.gov/plans/framework/>. Accessed January 12, 2018.

³⁶³ National Park Service (NPS). 2015. NEPA Handbook. Accessed from https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf. Accessed January 12, 2018.

³⁶⁴ NPS. 2010. National Mall Plan. Accessed from <https://www.nps.gov/nationalmallplan/National%20Mall%20Plan.html>. Accessed January 12, 2018.

³⁶⁵ Code of Virginia 15.2-22

³⁶⁶ DCMR 11

- District of Columbia, DC Code §§ 8-109.01 – 8.109.12, Subchapter V: Environmental Impact Statements³⁶⁷
- Arlington County Zoning Ordinance (2017)³⁶⁸

Relevant State and Local Guidance:

- Commonwealth of Virginia, Department of Environmental Quality, Procedure Manual: Environmental Impact Review of Major State Facilities (July 2013)³⁶⁹
- District of Columbia Office of Planning (DCOP), Comprehensive Plan for the National Capital – District Elements (amended 2012)³⁷⁰
- DCOP, Maryland Avenue SW Small Area Plan (2012)³⁷¹
- DCOP, Southwest Neighborhood Small Area Plan (2014)³⁷²
- Arlington County, General Land Use Plan (amended 2017)³⁷³
- Arlington County, Crystal City Sector Plan (2010)³⁷⁴
- Arlington County, Pentagon City Master Development Plan (1976)³⁷⁵

10.3. Study Area

For the purpose of analyzing impacts related to land use and property, a larger Local Study Area that extends beyond the Project Area (the tracks, bridges, and adjacent land, water, and infrastructure associated with the Long Bridge Project) was analyzed, encompassing land in the surrounding area that has the potential to be affected by the Proposed Action. The Local Study Area was determined based on an initial 0.5-mile buffer surrounding the Project Area. However, the analysis of land use also notes

³⁶⁷ DC Code 8-109.01-8.109.12

³⁶⁸ Arlington County Zoning Ordinance. Accessed from <https://building.arlingtonva.us/resource/zoning-ordinance/>. Accessed January 12, 2018.

³⁶⁹ Commonwealth of Virginia. 2013. Procedure Manual: Environmental Impact Review of Major State Facilities. Accessed from <http://www.deq.virginia.gov/Programs/EnvironmentalImpactReview/StateEnvironmentalImpactReviews.aspx>. Accessed January 12, 2018.

³⁷⁰ District of Columbia Office of Planning (DCOP). 2012. Comprehensive Plan for the National Capital, District Elements. Accessed from <https://www.ncpc.gov/plans/compplan/>. Accessed January 12, 2018.

³⁷¹ DCOP. Undated. Maryland Avenue SW Small Area Plan. Accessed from <https://planning.dc.gov/publication/maryland-ave-small-area-plan>. Accessed January 12, 2018.

³⁷² DCOP. Undated. Southwest Neighborhood Small Area Plan. Accessed from <https://planning.dc.gov/publication/southwest-neighborhood-plan>. Accessed January 12, 2018.

³⁷³ Arlington County. 2017. General Land Use Plan. Accessed from <https://projects.arlingtonva.us/plans-studies/general-land-use-plan/>. Accessed January 12, 2018.

³⁷⁴ Arlington County. 2010. Crystal City Sector Plan. Accessed from <https://projects.arlingtonva.us/neighborhoods/crystal-city-development/crystal-city-sector-plan/>. Accessed January 12, 2018.

³⁷⁵ Arlington County. 1976. Pentagon City Master Development Plan. Accessed from https://arlingtonva.s3.dualstack.us-east-1.amazonaws.com/wp-content/uploads/sites/31/2014/03/Metropolitan-Park_Pentagon-City-Master-Development-Plan.pdf. Accessed January 12, 2018.

some properties just outside the 0.5-mile buffer where land uses of local, regional, or national importance are present, or where land uses are potentially sensitive such as schools, community centers and recreational facilities, health care facilities, dependent care facilities, and places of worship). This Local Study Area was determined to be sufficient to capture proposed Project elements associated with all aspects of construction as well as land uses that extend beyond the Project Area itself but have the potential to be affected by the Project. The boundaries of this Local Study Area are shown in **Figure 10-1** and **Figure 10-2**, along with geographic points indicating the presence of potentially sensitive land uses.

A Regional Study Area was not established for Land Use and Property, since land use and property impacts related to this resource are not likely to occur at a regional scale. However, land uses beyond the Local Study Areas are considered generally in order to place the Local Study Area in context.

To document existing land use, zoning, and property ownership, a variety of sources were consulted, including:

- Land use and property data obtained from Arlington County's and the District's online GIS data, as well as maps produced by the DCOP
- Arlington County General Land Use Plan³⁷⁶
- Land use documentation completed as part of recent plans for the area, including the Crystal City Sector Plan, Southwest Ecodistrict Plan, Maryland Avenue SW Small Area Plan, and Southwest Neighborhood Plan
- Arlington County and District zoning codes and associated GIS data

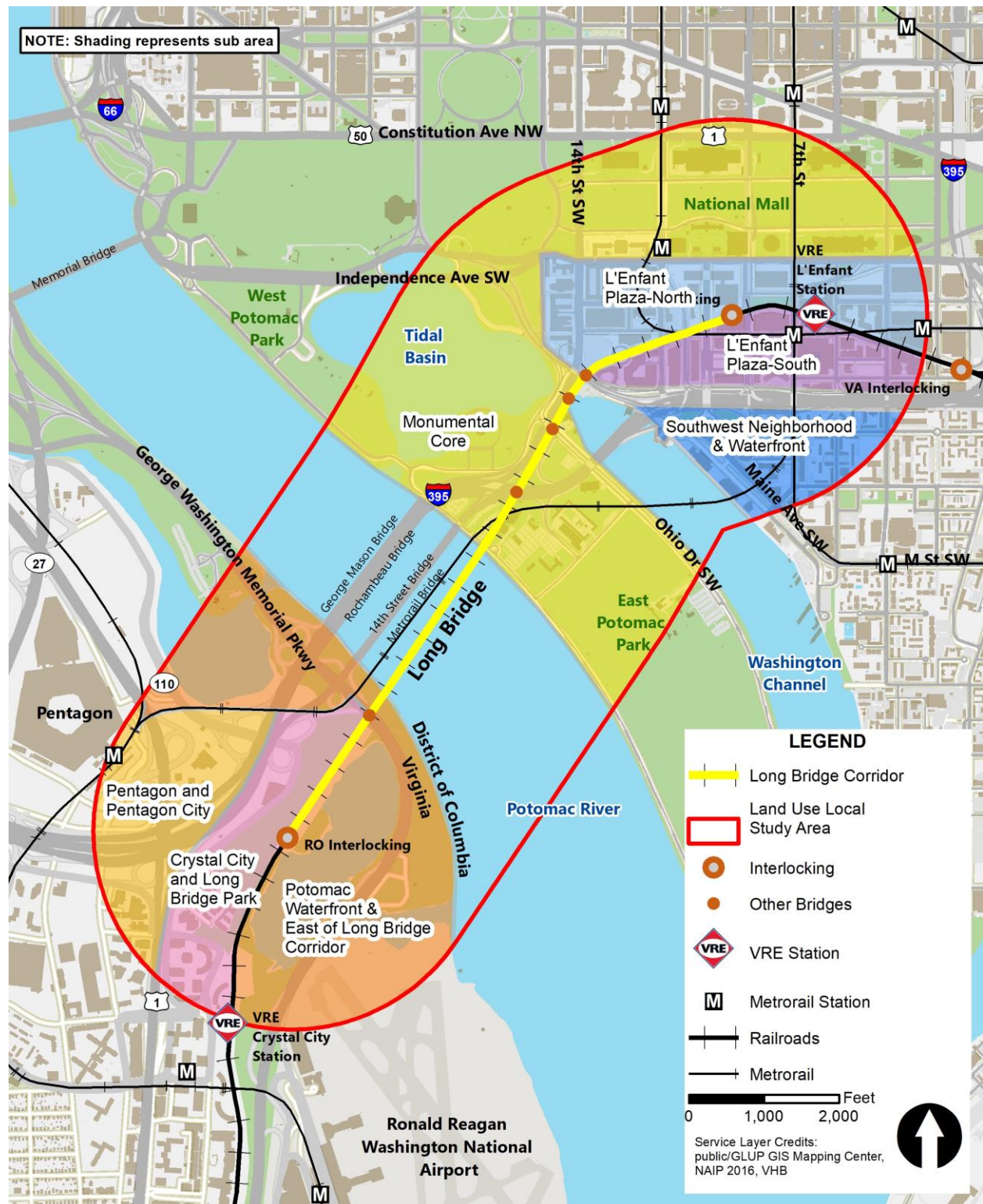
To address gaps in available land use data and to reflect the substantial recent development that has occurred within the Study Area, land use information was supplemented and cross-checked with in-person interviews with Arlington County and District planning staff, an online survey of the study area using Google Maps and Google Earth, and site visits to the Local Study Area. Information regarding plans and policies guiding future land use were obtained from the above sources, as well as from additional relevant planning documents, as noted in **Section 10.2, Regulatory Context and Guidance**, and **Section 10.4.4, Planned Future Land Use**.

³⁷⁶ Arlington County. 2017. General Land Use Plan. Accessed from <https://projects.arlingtonva.us/plans-studies/general-land-use-plan/>. Accessed January 12, 2018.

Figure 10-1 | Study Area for Land Use



Figure 10-2 | Land Use Sub-Areas



10.4. Methodology

Documentation of the Affected Environment involved describing the nature of land use and land ownership in the Local Study Area and identifying potentially sensitive areas such as schools, health care facilities, dependent care facilities, places of worship, community centers, and other community support service providers. The documentation also identified other land uses that provide important local or regional functions.

The following data sources were used in establishing existing land use conditions:

- District GIS Data
- Arlington County GIS Data
- Aerial photographs
- Field survey
- NCPC Comprehensive Plan for the National Capital – Federal Elements
- DCOP Comprehensive Plan for the National Capital – District Elements
- NCPC Monumental Core Framework Plan
- NCPC Southwest Ecodistrict Plan
- Arlington County General Land Use Plan
- Crystal City Sector Plan
- Southwest Neighborhood Small Area Plan
- Developer plans
- Metropolitan Washington Council of Governments (MWCOC) Cooperative Land Use Forecasts (Round 9.0)
- District of Columbia Office of Tax and Revenue
- Arlington County Office of the Treasurer
- Interviews with local and regional planning officials as needed
- Construction phasing data as available

10.5. Affected Environment

10.5.1. Existing Land Use

Existing land use in Arlington County and the District of Columbia portions of the Local Study Area are described separately below. For organizational purposes, the Local Study Area was divided into a series of land use sub-areas with geographical proximity and shared characteristics; these sub-areas are illustrated in **Figure 10-2**. A map of existing land use in Arlington County and the District of Columbia is provided in **Figure 10-3**.

Arlington County

The land within the Arlington County portion of the Local Study Area can be characterized as primarily public land devoted to a mix of parkland and transportation infrastructure. The southernmost portion of the Local Study Area includes primarily private commercial, residential, and mixed uses in the Crystal City area, while the westernmost portion includes the eastern edge of mixed-use development around Pentagon City (**Figure 10-3**). The following descriptions of sub-areas within the Local Study Area describe existing land use in greater detail.

Crystal City and Long Bridge Park

The Northeast Gateway portion of Crystal City is included in the Local Study Area. The multi-story buildings within this sector of Crystal City, all privately owned, support office, commercial, and residential uses, many of which contain privately controlled open space areas. The area also includes parking areas to support commuters. There are currently several ramps for accessing Jefferson Davis Highway, which are slated to be reconfigured as part of implementation of the Crystal City Sector Plan.

Long Bridge Park, owned and maintained by Arlington County, occupies the area west of the Long Bridge Corridor and north of the Crystal City development. The park offers a variety of activities for visitors, including sporting activities on three multi-sport recreational fields, a network of walking paths, and an elevated overlook at the park's northern end. A single private property, a storage facility, sits across Long Bridge Drive from the park. This area also includes the Crystal City Metrorail station, which is served by Metro's Yellow and Blue lines, as well as the Crystal City Virginia Railway Express (VRE) station. Great Commission's Community Church is located on Army Navy Drive, just west of Jefferson Davis Highway.

Pentagon and Pentagon City

Facilities associated with the Pentagon, the headquarters of the U.S. Department of Defense (DOD), are included in the Local Study Area and include a significant amount of land around it, including parking and other transportation-related uses. The Pentagon itself sits just outside the western boundary of the Local Study Area. The Pentagon requires full regulatory autonomy over its land uses and function, due to the sensitive nature of the work that is conducted there. The outer, western extents of the Local Study Area also include a small portion of the Pentagon City area, a private, high-rise, mixed-use center that contains a large regional mall, big box retail stores, high-rise residential and office buildings, vacant properties, and rapidly redeveloping land tracts. This area is served by both the Pentagon and Pentagon City Metrorail stations.

Potomac Waterfront and East of the Long Bridge Corridor

Land along the Potomac Waterfront is predominantly Federally owned parkland and open space interspersed with transportation-related uses. Parkland and open space includes the land encompassed by the Mount Vernon Trail, George Washington Memorial Parkway (GWMP), and Navy Merchant Marine Memorial. This area also includes the Roaches Run Waterfowl Sanctuary and Gravelly Point Park, both of which are extensions of the GWMP and are publicly accessible attractions. The western end of the Local Study Area also includes a portion of Columbia Island Marina, which provides boat access and

Long Bridge Project

docking for recreational boating and fishing in the Potomac River. Transportation uses include the GWMP and I-395, which intersect adjacent to the Long Bridge Corridor, and Ronald Reagan National Airport, the westernmost portion of which falls within the Local Study Area. While not located within the Local Study Area, Arlington National Cemetery is located just west and northwest of the Local Study Area.

District of Columbia

In the District of Columbia, the Local Study Area consists of public- and government-related land uses—including both government offices and public open space—interspersed with adjacent private land development, transportation infrastructure, and water bodies. The area is characterized by a growing area of residential and commercial land uses in the southwestern portion of the Local Study Area in the District. While this area and its vicinity consist largely of single-use buildings, it also includes emerging pockets of mixed-use development, typically with ground-floor retail uses, and office or residential uses on the upper floors.

Three Metrorail stations—L’Enfant Plaza, Smithsonian, and Federal Triangle—are located within the Local Study Area boundaries, providing connections to Metrorail’s Orange, Blue, Silver, Green, and Yellow Lines. Two additional stations—Waterfront-SEU (Green Line), and Metro Center (Orange, Blue, and Red Lines)—also serve portions of the Local Study Area, but are located outside the Local Study Area boundaries. In addition, the area is served by VRE commuter railroad at the L’Enfant Station.

Figure 10-3 shows existing land use patterns in relation to the Local Study Area. Due to the rapid development that has occurred in the Local Study Area during the past decade and the lack of up-to-date, publicly available land use data for the District, available land use data was groundtruthed during site visits and using Google Maps data. The land use data in **Figure 10-3** have been updated accordingly to reflect development that has occurred since the District’s land use data was last updated in 2006. More current information regarding existing land use in both jurisdictions is also captured in the following narrative.³⁷⁷

Existing land use is described in further detail below, organized by individual subareas of the larger Local Study Area. For the purposes of this analysis, the Local Study Area is divided into four subareas with shared characteristics: L’Enfant Plaza and Near Southwest-South; L’Enfant Plaza and Near Southwest-North; Southwest Neighborhood and Waterfront; and the Monumental Core.

L’Enfant Plaza and Near Southwest - South

Within the triangle of land formed by Maryland Avenue SW and Virginia Avenue SW to the north and I-395/Southwest Freeway to the south, land uses include predominantly private commercial and mixed-use development, with some additional Federal office uses. The U.S. Department of Housing and Urban Development (HUD) headquarters and a General Services Administration (GSA) National Capital Region office building occupy the central portion of this area between 7th and 9th Streets SW. Further west, land

³⁷⁷ Existing land use shown in Figure 9-3 was produced using DCOP mapping (Existing Land Use, Map Tiles 10, 11, and 13, dated April 21, 2006). Supplementary field verification was used to identify more recent changes in land use. In a personal communication, District of Columbia Geographic Information Systems (DCGIS) staff have indicated that more up-to-date land use data is currently in draft form and has not yet been released for public use.

uses are primarily private, consisting of several commercial office buildings including the L'Enfant Plaza and, at the southwestern terminus of Maryland Avenue SW, the Portals development, which includes the back entrance to the Mandarin Oriental Hotel and a private office building housing offices that serve the Federal Communications Commission (FCC) and U.S. Department of Agriculture (USDA). East of 7th Street, additional private property includes the mixed-use Constitution Center, the Hyatt Place Washington Hotel, the St. Dominic Catholic Church and associated priory at E and 7th Streets, a private office building housing the U.S. International Trade Commission and offices of the U.S. Social Security Administration, the Patriot's Plaza III office building, and a private office building along School Street SW and at Virginia Avenue and 6th Street SW. The lone Federally owned property west of 10th Street is the U.S. Postal Service building on the west side of 10th Street SW. A fire and emergency medical services (EMS) location for Engine Company 13 Fire is located at 6th and School Streets SW; a second location, which also includes Truck Company 10, is housed within the Hyatt Place hotel building.

In addition to the Mandarin Oriental and Hyatt Place hotels, additional hotel uses include the two buildings east of 10th Street SW that formerly housed the L'Enfant Plaza hotel; this complex is scheduled to reopen in 2018 as the Hilton Washington, DC National Mall Hotel. The Residence Inn by Marriott is located on E Street SW between 3rd and 4th Streets SW.

Public open spaces in the area include NPS Reservation 113 on the south side of Virginia Avenue, including Hancock Park, and Reservations 197 and 198. In addition, Benjamin Banneker Park, a Federal park, is the southern terminus of 10th Street SW (L'Enfant Plaza), just south of I-395 and Southwest Freeway.

L'Enfant Plaza and Near Southwest - North

Within the District, the Long Bridge Corridor crosses through the L'Enfant Plaza/Near Southwest Policy Focus Area. This area is bounded by 15th Street NW to the west, 2nd Street NW to the east, Independence Avenue on the north, and I-395 on the south. This area is currently defined by a mix of Federal office buildings and private commercial development; however, the area is rapidly evolving to include additional museum, office, hospitality and residential uses.

The northern portion of the Local Study Area, south of Independence Avenue and north of Maryland Avenue SW and Virginia Avenue SW, consists primarily of Federal office uses, interspersed with some private office buildings and public open space. In the eastern portion of this northern area, west of 6th Street, Federal facilities include two buildings east and west of 7th Streets SW serving the Federal Aviation Administration (FAA); four buildings in the vicinity of 10th Street SW serving the U.S. Department of Energy; the USDA headquarters and Cotton Annex; a Central Utility Plant operated by the GSA; buildings on both sides of 14th Street SW serving the U.S. Bureau of Engraving and Printing; and the Sidney R. Yates Federal Building (housing the U.S. Forest Service). Further east, additional Federally owned office buildings include Voice of America and offices of the U.S. Department of Health and Human Services and the U.S. Department of Education. Other land uses in this area include the United States Holocaust Memorial Museum on the west side of 14th Street SW, the Washington Global Public Charter School (at 6th and School Streets SW) and assorted private office buildings along the north sides of Maryland Avenue SW and Virginia Avenue SW.

Southwest Neighborhood and Waterfront

South of the I-395 and Southwest Freeway in the District, the Local Study Area includes a portion of the Southwest neighborhood and waterfront. This area is generally characterized by a mix of privately owned residential and commercial land uses interspersed with parks and open spaces, entertainment, education, institutional, and public uses.

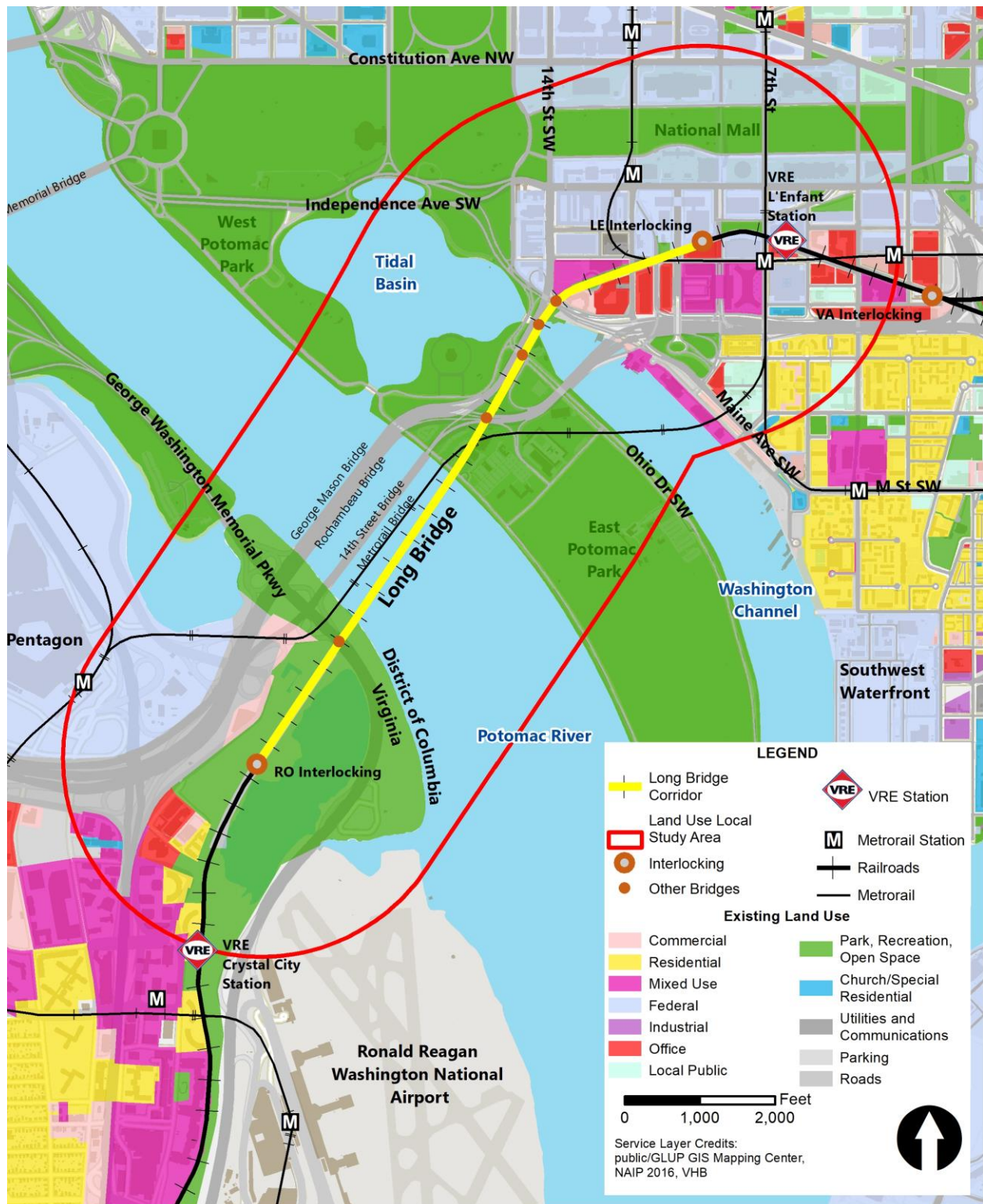
Immediately adjacent to the Washington Channel, land uses include the Washington and Gangplank Marinas, the historic Fish Market, and the newly constructed first phase of the District Wharf mixed-use development (900 residential units, 287 hotel units, 218,000 square feet of office, 141,000 square feet of retail, and 6,000 square feet of theater space) fronting Maine Avenue SW and the Washington Channel as well as along piers extending into the Washington Channel. Further north and east, residential uses predominate, with a mix of small and large multifamily structures as well as townhouses. Non-residential uses within the study area include the Arena Stage theater, located at the convergence of Maine Avenue SW, 6th Street SW, and M Street SW. South of G Street SW and west of 7th Street SW, educational uses—the Jefferson Middle School and adjacent recreational field as well as AppleTree Early Learning Public Charter School—border privately owned office buildings to the south and west. The eastern end of the study area includes a portion of the Amidon-Bowen Elementary School property at 4th and I Streets. The Riverside Baptist Church occupies the corner of Maine Avenue SW and 7th Street SW. Just beyond the eastern boundary of the Study Area sits the Southwest Duck Pond and Town Center parks along I Streets SW between 4th and 6th Streets SW, both of which are owned by the District and surround a second church, the Westminster Presbyterian Baptist Church property. The area just east of the Local Study Area boundary also includes recently developed mixed-use development along 4th Street SW between I and M Streets, adjacent to the Waterfront-SEU Metrorail station.

Monumental Core

The northern- and easternmost extents of the Local Study Area include portions of the District's Monumental Core. North of Independence Avenue and east of 14th Street, this area includes the National Mall open space and rows of museums along Jefferson Drive SW and Madison Drive NW. Further west and south of Constitution Avenue, the Local Study Area encompasses Federally owned parkland that includes portions of the National Mall and the Tidal Basin, the Jefferson Memorial, and a portion of West Potomac Park. The Washington Monument and surrounding grounds, the Lincoln Memorial, the Reflecting Pool, and surrounding grounds that include the Vietnam and Korean Memorials are all located further north and west of the Local Study Area boundary.

South of the Tidal Basin and Washington Channel, the Local Study Area also includes East Potomac Park, where Federal parkland is interspersed with a publicly owned golf course and, to the west, recreational facilities that include a public swimming pool and the East Potomac Tennis Center, offices of the NPS and U.S. Park Police, a DOD facility on NPS property, and the East Potomac Park maintenance facility.

Figure 10-3 | Existing Land Use



10.5.2. Existing Zoning

Arlington County

The Arlington County Zoning Ordinance (ACZO) of 2013 provides countywide land use as well as some form-based regulations for select locations.³⁷⁸ Current zoning within the Local Study Area is illustrated in **Figure 10-4**. According to the ACZO, which has been amended annually since its adoption in 2013, the majority of land within the Local Study Area is zoned Special Purpose and Public Service. Special Purpose land is largely Federally owned and similar to the unzoned area in the District in that no private commercial uses are permitted. There is also a small amount of land with industrial zoning along the corridor, immediately east and west of Long Bridge Park. The majority of the land in the southernmost portion of the Local Study Area comprises a mix of commercial and residential zones of varying intensities and height allowances.

In addition to base zoning (meaning the zones described in the zoning code), land use in the Arlington County portion of the Local Study Area is guided by area-specific standards to guide coordinated redevelopment in the Crystal City and Pentagon City areas. In the Crystal City area, the C-O Crystal City/Mixed Use Crystal City District encourages mixed-use development of office, retail and service commercial, hotel, and multiple-family dwelling uses within the area designated as the Crystal City Coordinated Redevelopment District on the General Land Use Plan. This district advances the gradual and coordinated redevelopment of each block in the Crystal City Coordinated Redevelopment District as envisioned by the Crystal City Sector Plan. The district includes specific standards related to land use and site design, density, build-to lines, bulk-plane angles,³⁷⁹ tower separation and coverage, and other standards consistent with the vision of the Crystal City Sector Plan.

In the Pentagon City area, the Pentagon City Phased Development Site Plan advances the vision of the Pentagon City Master Development Plan. First established in 1976, this district continues to guide coordinated, mixed-use redevelopment of the Pentagon City area, allocating allowable densities for a series of identified development parcels. Additional future planned growth is anticipated, including within a small portion of district that is included in the western end of the Local Study Area.

³⁷⁸ Arlington County. 2018. Zoning Ordinance Update. Accessed from <https://building.arlingtonva.us/wp-content/uploads/sites/38/2016/06/ACZO.pdf>. Accessed May 8, 2018.

³⁷⁹ The bulk plane is a series of planes that limit the allowable volume of space a building can occupy. The purpose of the bulk plane is to allow adjacent properties access to sunlight and to maintain privacy.

Figure 10-4 | Existing Zoning



District of Columbia

In 2016, the DCOP updated its zoning code to create the District's Zoning Regulations of 2016. These new zoning designations are reflected in **Figure 10-4**. A considerable amount of land within the Local Study Area is unzoned since it is Federally owned and, therefore, not subject to District development regulations. This zoning is not reflective of the plans and land use recommendations for the Southwest Ecodistrict Initiative. The other predominant zoning categories within the District portion of the Local Study Area are mixed use and residential (with varying degrees of intensity and height allowances). In addition, a significant portion of land within the Study Area is zoned Downtown (D-4, D-5, and D-8), which permits a high-density mix of office, retail, service, residential, entertainment, lodging, institutional, and other uses in 11 zones throughout Central Washington.

10.5.3. Existing Property Ownership

The Long Bridge Corridor is owned by CSX Transportation, Inc. (CSXT), which acquired ownership of the railroad right-of-way in 1999. Surrounding properties, as the Corridor passes through portions of the District and Arlington County, consist of both privately and publicly owned land, as described below. Property ownership patterns were derived from District GIS data, from Arlington County GIS data and the General Land Use Plan, and from local planning guidance for Crystal City, the Southwest Ecodistrict, and the Southwest Neighborhood. In addition, a survey of the Long Bridge Corridor, completed in 2014 as part of the Phase II study, yielded additional insights regarding property ownership immediately adjacent the Local Study Area.

Arlington County

Land immediately adjacent to the Long Bridge Corridor is generally publicly owned along the northern portion of the corridor and privately owned south of Long Bridge Park. As the Long Bridge Corridor crosses the Potomac River, it passes through Federal land along the GWMP, and a narrow strip of land immediately adjacent to the Long Bridge Corridor is owned by a private entity, Crescent Potomac Yard Dev LLC. Land owned by Arlington County abuts the Long Bridge Corridor on both sides further east and west. The western side of the Long Bridge Corridor abuts the County-owned Long Bridge Park, while the eastern side abuts a narrow strip of County-owned land that encompasses the western shoreline of the Roaches Run Waterfowl Sanctuary.

South of 6th Street South, the land immediately adjacent to the Long Bridge Corridor is owned by another private entity (RF&P Railway Co. CESC Park Three Land LLC). Land further west is private development owned by numerous different private entities, while land further to the east is Federally owned land associated with the GWMP.

The majority of land in the northern and western portions of the Arlington County side of the Local Study Area is publicly owned. Land adjacent to the Potomac River and along the GWMP is owned by the Federal government and managed by NPS, while Ronald Reagan Washington National Airport is owned by the U.S. Department of Transportation (USDOT) and leased by the Metropolitan Washington Airports Authority (MWAA). Other than the western shoreline, the majority of the Roaches Run Waterfowl Sanctuary, east of the Long Bridge Corridor, is also Federally owned and is included as part of land administered under the GWMP. The area west of the Long Bridge Corridor includes the Arlington

County-owned Long Bridge Park property and a single private property on the west side of Long Bridge Drive.

Land further south and west of Long Bridge Park includes predominantly privately-owned properties at the northern end of the Crystal City district and a portion of the Pentagon City area to the west, with exception of one triangular parcel of vacant land at Eads Street and 11th Street belonging to Arlington County. The I-395 corridor falls within the Virginia Department of Transportation (VDOT) right-of-way, while the Pentagon and surrounding land are owned by the Federal government.

District of Columbia

In the District, land immediately adjacent to the Long Bridge Corridor similarly includes a mix of public and private ownership. After crossing the Potomac River, the Long Bridge Corridor passes through Federal land owned by the National Park Service (NPS) at East Potomac Park. After crossing over the Washington Channel, the Long Bridge Corridor passes underneath the privately owned Portals development at the terminus of Maryland Avenue SW (where land is owned by several private entities) before resurfacing within the Maryland Avenue SW street right-of-way. As the Long Bridge Corridor follows the alignment of Maryland Avenue SW between 12th and 10th Streets SW, it abuts streets, sidewalks, and overpasses that fall within the District of Columbia public right-of-way. Land along the north side of the Long Bridge Corridor in this segment also includes the Federally owned NPS Reservation 197, as well as parking lots and vacant land also under Federal ownership.

East of 10th Street (L'Enfant Plaza), the southern border of the Long Bridge Corridor includes privately owned land, a triangular parcel of land owned by the District of Columbia. Along the north side of the Long Bridge Corridor, land is Federally owned. At 9th Street SW and further to the east, land along the north side of the Long Bridge Corridor is also Federally owned and includes two U.S. Reservations: Reservation 112A, which occupies the 9th Street SW alignment, and Reservation 113, which extends along the northern edge of the Long Bridge Corridor from 9th Street SW to 7th Street SW. Land south of the Long Bridge Corridor along this segment is also Federally owned.

As described in **Section 10.5.1**, property ownership within the larger Study Area in the District generally includes a mix of public and private ownership. The highest concentrations of publicly owned land are located in the areas north of D Street SW and west of 14th Street as well as along both sides of the Potomac River. This land is primarily Federally owned and includes government office buildings in the L'Enfant Plaza Area, the National Mall and adjacent museums, and Federal parkland that includes the grounds of the Lincoln and Jefferson Memorials, the Washington Monument grounds, the Tidal Basin, and East and West Potomac Parks. The remainder of the District of Columbia study area consists of higher concentrations of privately owned land, interspersed with some Federally and District-owned properties.

Federal and local public land uses in the District of Columbia are indicated in the existing land use map in **Figure 10-3**.

10.5.4. Planned Future Land Use (2040)

Due to the rapidly evolving nature of land use within the Study Area, assessing potential land use impacts requires a baseline understanding of anticipated land use changes by the Long Bridge Project's 2040 opening date. This understanding of future land use is informed by local planning guidance in the District and Arlington County, as well as by ongoing and future development projects currently in the pipeline. Planned future land use in Arlington County and the District is shown in **Figure 10-5**.

Arlington County

Arlington County's General Land Use Plan is regularly updated to reflect the latest future land use plans. While future land use plans for the entire Local Study Area are likely to change and evolve by the proposed 2040 opening date for the Proposed Action, the plan is an accurate guide for future buildout of the Crystal City and Long Bridge area, given that the Crystal City Sector Plan provides a 40-year vision that is not anticipated to be fully implemented until after 2040. In this area, land surrounding the Long Bridge Corridor is likely to reflect the plan's goals of encouraging denser development that supports a greater balance of office, residential, retail, cultural, and civic uses, as existing commercial uses are converted to a greater mix of uses that include new residential development. The plan also encourages the establishment of neighborhood centers to act as community hubs around higher-density, mixed-use buildings and aims to transform Jefferson Davis Highway into a more walkable urban boulevard while increasing overall pedestrian accessibility in the area. Redevelopment is expected to advance incrementally as individual buildings are retrofitted over time.

In the near term, the County is advancing plans to design and construct an aquatic and fitness center (Long Bridge Aquatic Center) on a new, 10.5-acre northern portion of Long Bridge Park, immediately adjacent to the Long Bridge Corridor. Construction could start as early as 2018, and the facility is expected to open in 2021.

District of Columbia

Figure 10-5 illustrates future land use, as envisioned by the DCOP Comprehensive Plan for the National Capital – District Elements, most recently amended in 2012. This plan is currently being updated by the DCOP. In addition, small area plans in or near the Local Study Area have been adopted since 2012, including the Southwest Neighborhood Plan, the NCPC Southwest Ecodistrict Plan, and the Maryland Avenue SW Plan. Given that the Comprehensive Plan provides a 20-year vision for land use, anticipated future land use by the 2040 opening date will be reflected only in subsequent updates to the plan after 2020.

Figure 10-5 | Planned Future Land Use



Based on existing plans, such as the Southwest Ecodistrict Plan and the Maryland Avenue SW Plan, the L'Enfant Plaza and Near Southwest areas are anticipated to evolve into a well-connected series of mixed-use districts that balance existing commercial and government uses with additional commercial, residential and cultural uses, while making Maryland Avenue SW a more continuous pedestrian corridor. The L'Enfant Plaza area has recently begun to transition into a museum destination, with the opening of the privately owned Museum of the Bible at 3rd and D Streets SW. A second new museum, a new location for the privately owned International Spy Museum, is scheduled to open in fall 2018 on a parcel bounded by 9th Street, SW, 10th Street SW, and D Street SW. Other recent and ongoing construction includes a private office building and conference center at 500 L'Enfant Plaza that also includes structured parking, 20,000 square feet of on-site amenities including more than 20 dining options and a dozen retailers, and 70,000 square feet of green space; the anchor office tenant, the Urban Institute, is scheduled to occupy the space in 2019. Moreover, the Portals development at the southwestern terminus of Maryland Avenue SW is scheduled to expand with the addition of a 13-story, 373-unit condominium complex at 1331 Maryland Avenue SW. The future site of the Eisenhower Memorial is located on the south side of Independence Avenue between 4th Street SW and 6th Street SW; groundbreaking for the project occurred in November 2017.

11.0 Noise and Vibration

11.1. Overview

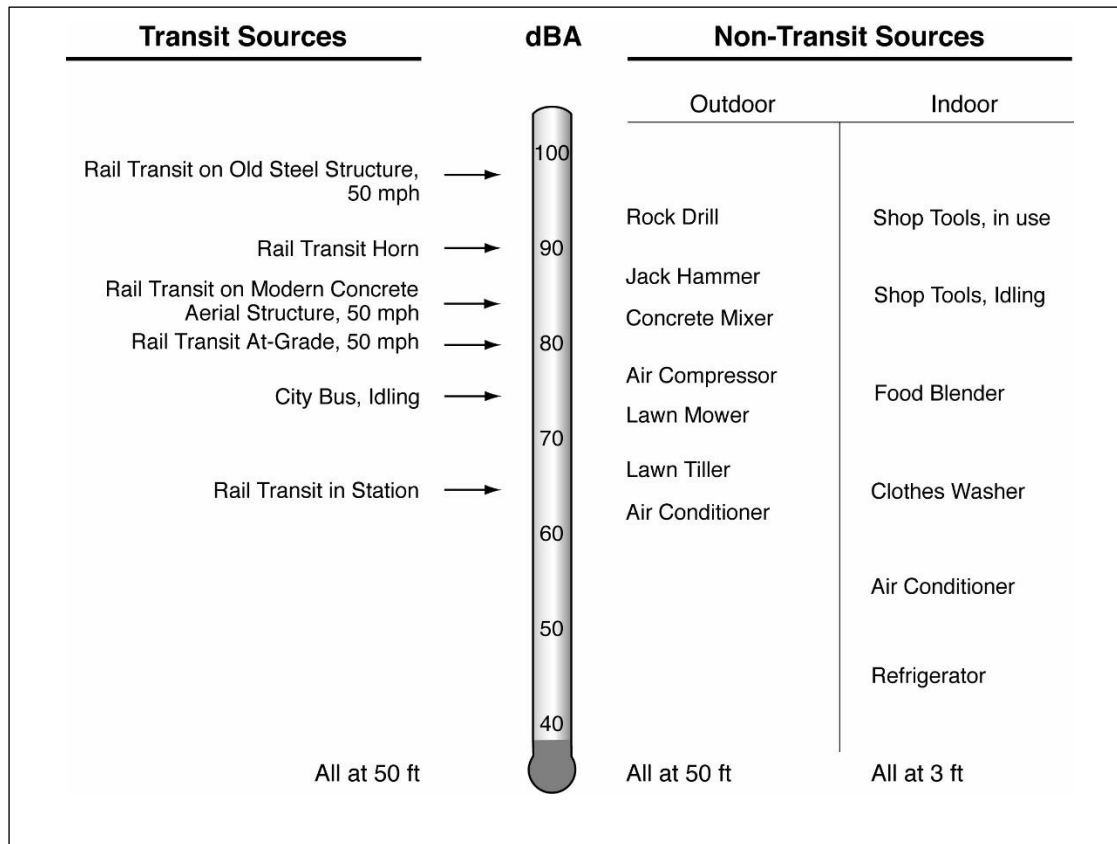
This section defines noise, vibration, and ground-borne noise resources and descriptive metrics. This section also summarizes the regulatory context of the assessment for the Project, defines the noise and vibration study area, identifies sensitive receptor locations, characterizes existing noise and vibration conditions, and presents the results of existing noise and vibration measurements.

11.1.1. Noise and Vibration Descriptors

Noise is typically defined as unwanted or undesirable sound. Noise is evaluated based on its potential to cause human annoyance. Because humans can hear certain frequencies or pitches of sound better than others, sound levels are measured and reported using a descriptor called the **A-weighted sound level**. A-weighted sound levels weight different frequencies of sound to correspond to human hearing and are expressed in decibel notation as **dBA**. Because sound levels fluctuate from moment to moment, it is important to characterize the range of levels that may exist over a period. The following sound level metrics are used in the noise assessment for the Project:

- **Maximum A-weighted Level (L_{max})** represents the highest sound level generated by a source. For mobile sources, the maximum level typically occurs when the source is closest to the measurement or analysis location. **Figure 11-1** presents typical maximum sound levels including transit sources and non-transit sources.
- **Energy-average Level (Leq)** is a single value that is equivalent in sound energy to the fluctuating levels over a period. The Leq accounts for how loud events are during the period, how long they last, and how many times they occur. Typically, Leq sound levels are used to describe the time-varying sound level over a one-hour period and may be denoted as Leq_{1h}. Leq is commonly used to describe environmental noise and relates well to human annoyance.
- **Day-night Average Level (L_{dn})** is a single value that represents the sound energy over a 24-hour period with a 10-decibel (dB) penalty applied to sound that occurs between 10:00 PM and 7:00 AM, when people are more sensitive to noise. L_{dn} accounts for how loud events are, how long they last, how many times they occur, and whether they occur at night. L_{dn} is commonly used to describe environmental noise and relates well to human annoyance at places where people sleep.
- **Sound Exposure Level (SEL)** describes the cumulative noise exposure from a single noise event over its entire duration. In calculating SEL, the noise exposure is normalized to a time-duration of one second so that events with different durations can be evaluated in terms of their sound energy.

Figure 11-1 | Typical A-weighted Maximum Sound Levels for Transit Sources and Non-Transit Sources

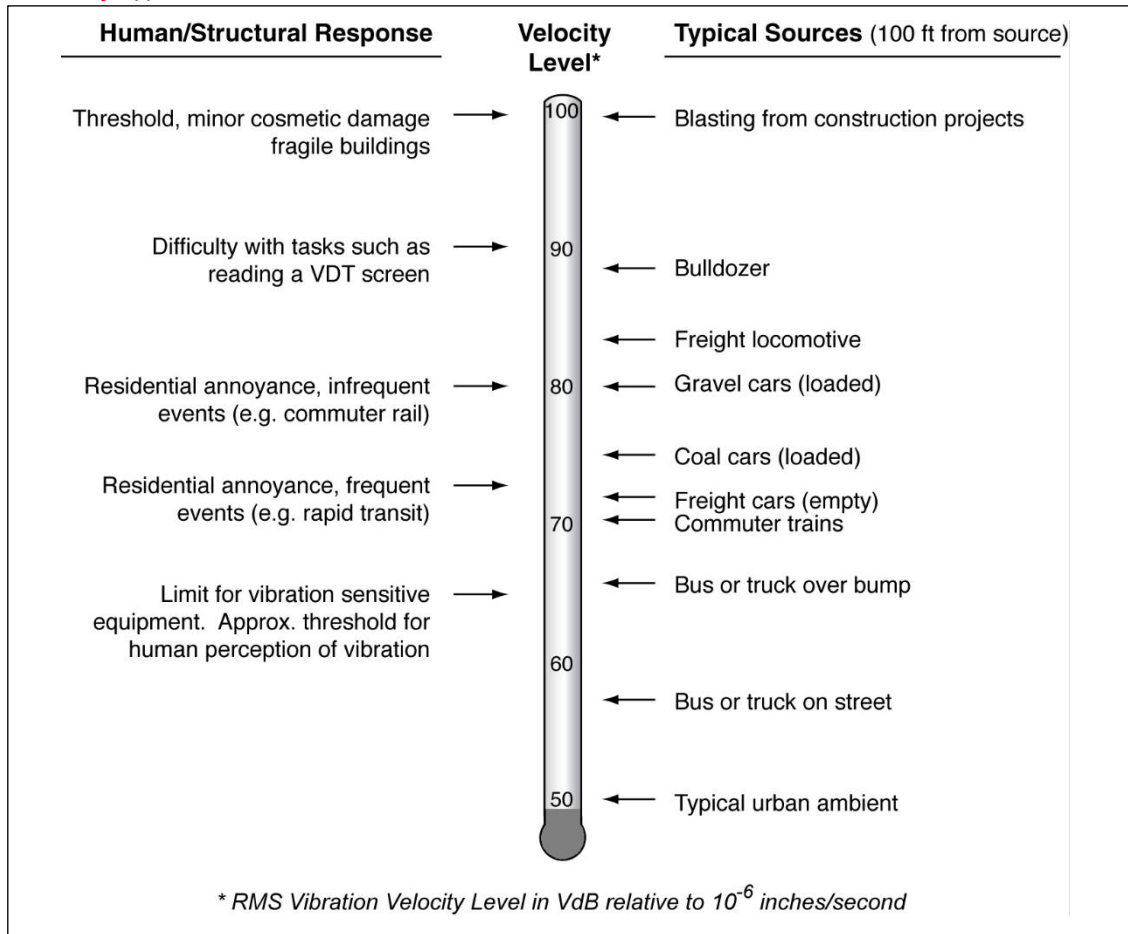


Source: FTA, 2006

Trains also generate ground-borne vibration (defined as the oscillatory motion of the ground), when forces associated with the wheel-rail interaction are transmitted through the track structure into the ground and into adjacent buildings. Vibration may be perceptible and disturb people or sensitive activities in nearby buildings. Humans generally respond to vibration in a low frequency range between approximately 4 and 80 hertz (Hz).

Vibration levels are expressed in decibel notation as **dBV** to differentiate them from sound decibels. Overall vibration levels reported in this study include frequencies between 4 and 400 Hz. Vibration levels may also be reported at particular frequencies such as one-third octave bands. **Figure 11-2** presents typical ground-borne vibration velocity levels from transportation and construction sources and the typical human and structural response.

Figure 11-2 | Typical Ground-borne Vibration Levels



Source: FTA, 2006

Ground-borne noise is generated when vibration propagates into a room and causes the walls, ceilings, and floor to vibrate and generate a low frequency rumble. Ground-borne noise is generally only perceptible in buildings where airborne paths (such as paths through windows or openings) are not present. Ground-borne noise is of particular concern for special-use buildings such as theatres and recording studios.

Ground-borne noise is expressed in A-weighted sound level decibels like airborne noise. Because ground-borne noise is generated by ground-borne vibration, it is most prevalent in a low audible frequency range between approximately 20 and 500 Hz.

11.2. Regulatory Context and Guidance

The following laws, regulations, agency jurisdictions, and guidance are pertinent to noise and vibration resources. Key regulations and guidance that are most relevant to the Project are listed below.

11.2.1. Noise and Vibration Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- The National Environmental Policy Act (NEPA) of 1969 requires the significance of potential impacts be evaluated in terms of the context and intensity of potential effects.³⁸⁰ These regulations and procedures state that an Environmental Impact Statement (EIS) should assess potential noise and vibration effects.

Relevant Federal Guidance:

- Federal Railroad Administration (FRA) Procedures for Considering Environmental Impacts³⁸¹
- FRA High-Speed Ground Transportation Noise and Vibration Impact Assessment (FRA guidance manual)³⁸²
- Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment (FTA guidance manual)³⁸³
- U.S. National Park Service (NPS) – Director’s Order 47: Soundscape Preservation and Noise Management³⁸⁴

11.2.2. Noise and Vibration State and Local Laws, Regulations, and Other Guidance

Relevant State and Local Laws and Regulations:

- The District of Columbia noise ordinance (District of Columbia Municipal Regulations [DCMR] Chapters 20–27) is intended to promote public health, safety, welfare, and the peace and quiet of the inhabitants of the District, and to facilitate the enjoyment of the natural attraction of the

³⁸⁰ Public Law 91-190, 42 USC 4321-4347

³⁸¹ 64 FR 28545

³⁸² Federal Railroad Administration (FRA). September 2012. High-Speed Ground Transportation Noise and Vibration Impact Assessment. Report DOT/FRA/ORD-12/15. Accessed from <https://www.fra.dot.gov/eLib/Details/L04090>. Accessed June 6, 2017.

³⁸³ Federal Transit Administration (FTA). May 2006. Transit Noise and Vibration Impact Assessment. Report FTA-VA-90-1003-06. Accessed from https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf. Accessed June 6, 2017.

³⁸⁴ National Park Service (NPS) Director's Order 47. U.S. National Park Service Soundscape Preservation and Noise Management. Accessed from <https://www.nps.gov/policy/DOrders/DOrder47.html>. Accessed May 1, 2018.

District.³⁸⁵ Sound generated by trains, other than Washington Metropolitan Area Transit Authority (WMATA) railcars, is exempt from this ordinance. This ordinance applies primarily to construction-period activities and sound generated by stationary equipment such as ventilation equipment and rooftop mechanical equipment.

- The Arlington County noise control ordinance (Arlington County Code Chapter 15) was developed to protect the public's health, safety, welfare, and quality of life.³⁸⁶ The noise ordinance imposes non-construction period noise limits for motor vehicles and stationary sources.

Relevant State and Local Guidance

- There are no additional relevant state and local guidance documents for this resource.

11.3. Study Area

As shown in **Figure 11-3**, the Study Area for noise and vibration includes the physical limits of the proposed Project (the Project Area) and noise- and vibration-sensitive locations near the Project. The Study Areas for noise and vibration must extend sufficiently far from the Project limits to include all locations where substantial noise and vibration effects, potential impacts, and benefits from potential mitigation may occur.

To determine the Study Area extents, the FTA has screening distances that indicate where there is potential for noise or vibration impact to occur. If there are sensitive uses within these screening distances, then there is the potential for impact and further evaluation is necessary to verify whether there would be impact, the context and intensity of impact, and the need for mitigation.

The noise Local Study Area is 750 feet from the track alignment without intervening buildings and 375 feet with intervening buildings for mainline commuter railroad operations. The vibration screening distance depends on the type of sensitive land use and the type of railroad project. For commuter railroad operations, the vibration screening distance is 200 feet for residential uses, 120 feet for institutional uses, and up to 600 feet for particularly sensitive receptors such as research facilities with vibration-sensitive equipment, theatres, and recording studios. Noise- and vibration-sensitive land uses within these screening distances have been identified and are summarized in **Section 11.4.2**.

Noise and vibration is typically not assessed at a regional level for this project type, since noise and vibration effects occur more locally to the project footprint; therefore, no Regional Study Area has been developed.

³⁸⁵ DCMR 20-27

³⁸⁶ Arlington County Code Chapter 15

Figure 11-3 | Study Area for Noise and Vibration



11.4. Methodology

The process to evaluate the affected environment for noise and vibration included identifying noise- and vibration-sensitive receptors, understanding the predominant sources of noise and vibration, and characterizing existing noise and vibration conditions through measurements.

11.4.1. Noise and Vibration Sensitive Land Use Categories

Existing noise- and vibration-sensitive receptors in the Local Study Area were identified based on a review of aerial photography, District Office of Zoning database information, Arlington County Geographic Information Systems (GIS) database, and field investigations. Receptors were categorized according to their use as defined by the FTA; the FTA definitions are provided in **Table 11-1**.

Table 11-1 | FTA Land Use Categories and Metrics for Transit Noise Impact Criteria

FTA Land-Use Noise Category	Noise Metric (dBA)	Description of Land-Use Category
1	Outdoor Leq*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as national historic landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor Ldn	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor Leq ¹	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, and museums can also be considered in this category. Certain historical sites, parks, campgrounds, and recreational facilities are also included.

Notes: 1 - Leq for the noisiest hour of related activity during hours of noise sensitivity.

Source: FTA. 2006. *Transit Noise and Vibration Impact Assessment*

Noise receptors were categorized into the FTA Land Use Noise Categories based on the human use of the property as it relates to the potential for noise to cause human annoyance. Receptors are primarily located at ground level outdoor areas of frequent human use. If an upper-floor multi-family residence or hotel has exterior areas such as balconies or roof decks, then receptors are located at these upper elevations. For some residences and institutional facilities, such as medical facilities, museums, schools, and recording studios, receptors may be located inside of the building if there are no areas of frequent outdoor human use. Parks that have areas for passive recreation are considered to be sensitive to noise.

Commercial and industrial properties are not typically evaluated for operational noise impact unless there are outdoor areas of frequent human use. Residential, institutional, commercial, and industrial land uses are typically evaluated for construction-period noise effects.

Vibration-sensitive land uses are similar to noise-sensitive land uses except that vibration, as it relates to human annoyance, is only evaluated inside buildings and is not evaluated at parks. All buildings and structures are evaluated for potential structural damage due to high-impact construction equipment such as impact pile driving. The thresholds for potential structural damage are greater than the thresholds for human annoyance. Train operations generally do not generate sufficient vibration to cause structural damage unless the trains are extremely close to sensitive buildings. Historic properties are often more susceptible to vibration and have lower thresholds for increased risk of structural damage.

As described in **Section 13.0, Cultural Resources**, several historic districts and historic properties are located within the noise and vibration Local Study Area. The sensitivity of these cultural resources to noise and vibration are based on their human use and how they relate to the FTA Land Use Noise Categories. For example, a residence that is a historic property is a Category 2 receptor. A historic museum is considered a Category 3 receptor. Potential noise and vibration effects related to human annoyance are assessed using the same criteria for historic properties and non-historic properties, unless a quiet environment is an essential aspect of the property and part of the character defining its historic or cultural significance, as is the case with Category 1 receptors. National historic landmarks with significant outdoor use, where serenity and quiet are significant attributes, are Category 1 receptors.

Historic properties with noise- and vibration-sensitive use are included in the impact assessment for human annoyance; however, all historic properties, as well as all other buildings and structures, are assessed for potential structural damage due to vibration during construction or for train operations within approximately 10 feet.

11.4.2. Noise-Sensitive Land Uses

Noise- and vibration-sensitive land uses in the Local Study Area were identified based on a review of aerial photography, DC Office of Zoning database information, and field investigations. Receptors were categorized according to their use as defined by the FTA and described in **Table 11-11**.

The Mandarin Oriental Hotel is an FTA Noise and Vibration Category 2 land use since it is a building where people sleep. As described in **Section 13.0, Cultural Resources**, historic districts and historic properties within the Study Area include the Mount Vernon Memorial Highway (MVMH) Historic District, East and West Potomac Parks Historic District, National Mall Historic District, George Washington Memorial Parkway (GWMP) Historic District, the Jefferson Memorial, Central Heating Plant, United States Department of Agriculture (USDA) Cotton Annex, and the Bureau of Engraving and Printing. The following describes noise-sensitive land uses that are also cultural resources:

- The Long Bridge Park (within the GWMP Historic District) has areas for passive recreation and is an FTA Noise Category 3 land use;

- The Jefferson Memorial (within the East and West Potomac Parks and National Mall Historic Districts) is a historic landmark with significant outdoor use and is therefore considered to be an FTA Noise Category 1 land use;
- The Cuban Friendship Urn (within the East and West Potomac Parks and National Mall Historic Districts) is an area for passive recreation and is an FTA Noise Category 3 land use; and
- The Bureau of Engraving and Printing is considered an institutional property like a museum and is an FTA Noise Category 3 land use.

Historic districts and historic properties that are not sensitive to noise and do not meet any of the FTA Noise Categories include:

- Mount Vernon Trail (within the MVMH Historic District), since it only has active recreational areas;
- Rock Creek Park Trails (within the East and West Potomac Parks Historic Districts), since it only has active recreational areas; and
- Central Heating Plant and USDA Cotton Annex, since they are industrial land uses.

11.4.3. Noise and Vibration Measurements

The FTA methods for characterizing existing conditions include conducting ambient noise and vibration measurements in the study area. FTA recommends that measurements are not conducted at each receptor location in a study area, but instead conducted at locations that are representative of a cluster of sensitive uses.

Measurements were conducted from January 24 to 25, 2018, to determine the existing noise and vibration conditions in the Local Study Area. Noise and vibration measurements were conducted at a total of eight locations, as shown in **(Figure 11-3)**, including four locations with noise only, three locations with noise and vibration, and one location with vibration only. Noise measurements were conducted using Larson Davis 831 sound level meters that meet American National Standards Institute Type I accuracy standards. The measurements were conducted following FTA and Federal Highway Administration (FHWA) recommended methods and procedures. Observations of train operations were recorded during short-term measurements.

The National Park Service (NPS) has methods for ambient sound monitoring, as described in NPS Reference Manual #47, for characterizing soundscapes.³⁸⁷ This methodology can often include longer-term ambient sound monitoring (such as 2 weeks or more) and on-site listening to document the prevalent sources of sound and what percent of the time they are audible to humans. The purpose of conducting measurements for an extended duration is to more completely characterize the existing sound conditions to allow NPS Park Managers to manage sound as a resource of the park. The focus of the Long Bridge Project impact assessment is to evaluate the potential noise and vibration effects from improvements to the Long Bridge Corridor rather than fully characterizing sound as a park resource. Therefore, ambient sound measurements at NPS sites have been conducted according to FTA methods with additional consideration of NPS methods. Acoustic data collection included 1-second one-third octave-band sound levels and high-quality continuous audio recordings. Continuous observations and audibility logging were conducted to determine the percentage of time that various sources contribute to the soundscape.

When characterizing NPS soundscapes, acoustic monitoring often coincides with detailed atmospheric data collection. Atmospheric conditions are very important in low-noise environments where sources of sound such as wind through the trees or wind across the microphone can significantly influence the sound measurement results. Such detailed atmospheric conditions (for example, second-to-second wind conditions) are not as critical a factor for the measurements at the Jefferson Memorial and George Mason Memorial since they are in a higher ambient sound environment due to their proximity to roadways, the Long Bridge Corridor, and airport operations. Therefore, atmospheric conditions from nearby regional weather stations were monitored throughout the day.

Atmospheric conditions on January 24, 2018, included wind speeds up to 12 mph from the northwest, temperatures between 35 and 48 degrees Fahrenheit, a dew point of 26 degrees Fahrenheit, and no precipitation. On January 25, 2018, atmospheric conditions included wind speeds up to 10 mph from the northwest, temperatures between 31 and 42 degrees Fahrenheit, a dew point of 18 degrees Fahrenheit, and no precipitation.

At Sites NV1, N2, NV3, N4, and N5, which include Category 1 (National Historic Landmarks) and Category 3 (institutional) receptors, noise measurements were conducted for 1 hour during a peak transit period (morning or afternoon) to determine the peak-transit Leq. The peak-transit periods are from 6 AM to 9 AM and from 3 PM to 6 PM based on the number of train operations during these periods. The 1-hour energy equivalent sound level (Leq) is used to characterize the existing noise conditions and assess potential impact for these land use categories.

At Site N8 (Mandarin Oriental Hotel), which is a Category 3 (residential) receptor, measurements were conducted for three 1-hour periods including a late-night and early-morning, peak and mid-day period to determine the peak-transit Leq and estimate the Ldn. Ldn levels have been estimated based on the methods described in the FTA guidance manual.

Noise measurements were conducted at Site NV6, which is a Department of Defense (DOD) facility with unknown use, for one hour during the midday and afternoon peak periods to characterize existing noise conditions at locations which include exposure to railroad operations, WMATA trains, and traffic on I-

³⁸⁷ NPS Director's Order 47

395. Supplemental

short-term measurements were conducted for up to 30 minutes at additional locations along the Mount Vernon Trail (Site N2) to characterize the existing noise conditions at different distances from the Long Bridge Corridor and within the Jefferson Memorial structure (Site NV3) to characterize the interior space of the landmark.

Vibration measurements were conducted at four locations as shown in **Figure 11-3**. Vibration measurements of train pass-bys were conducted using PCB type 393A accelerometers, PCB Model 480E09 signal conditioners, a PCB 294C06 handheld shaker, and Rion D-21 4-channel digital recorders. The accelerometers were calibrated in the field and by a laboratory traceable to the National Institute of Standards and Technology. The recorded vibration data were then processed into vibration velocity levels using digital signal processing software. The vibration measurements were conducted for typically 1 to 2 hours during peak morning or afternoon periods to capture mostly Virginia Railway Express (VRE) and Amtrak trains or during the midday period to capture CSXT freight trains.

11.5. Affected Environment

The following sections describe the existing noise and vibration sources, noise results, and vibration results for the study area.

11.5.1. Existing Noise and Vibration Sources

The predominant sources of noise in the Local Study Area include railroad operations and traffic on roadways. The predominant source of vibration in the Local Study Area is railroad operations. Roads contributing to the noise environment in Arlington include the GWMP and Long Bridge Drive. Roads in both Arlington County and the District include the Henry Shirley Memorial Highway, 14th Street Bridge, Southwest Freeway, and Arland D. Williams Jr. Memorial Bridge. Local roadways in the District also contributing to the noise environment in the Local Study Area include East Basin Drive SW, 14th Street SW, Maryland Avenue SW, Ohio Drive SW, Maine Avenue SW, and 12th Street SW.

Railroad operations in the Local Study Area include VRE and Amtrak commuter railroad passenger service, CSXT freight trains, and WMATA Metrorail Yellow Line rapid transit operations.

Current VRE commuter railroad service is primarily a peak-period service, with 14 morning arrivals between 6:00 and 9:05 AM, and 15 afternoon departures between 1:10 and 7:05 PM. VRE operates eight daily round-trips on the Fredericksburg line and eight on the Manassas line. Additionally, 12 daytime Amtrak trains and approximately 16 CSXT freight trains travel through the corridor per day, including 10 during the day and six during the night.³⁸⁸ Existing VRE trains typically include one diesel locomotive and between four and eight passenger coaches. Amtrak trains include two diesel locomotives and approximately eight passenger coaches. CSXT freight trains vary, with some trains including two or more diesel locomotives and 100 or more railroad cars.

There are no grade-crossings in the Local Study Area where passenger trains would routinely sound their horn. VRE, Amtrak, and CSXT trains follow CSXT operating procedures, which require trains to sound their horns while approaching passenger stations. The trains sound their horns according to FRA

³⁸⁸ Based on the most recent VRE schedules for the Manassas and Fredericksburg Lines. Effective March 6, 2017.

regulations, which are to sound their horns within 0.25 miles of the station. The nearest passenger stations, Crystal City VRE Station to the south and L'Enfant VRE Station to the north, are just outside the Local Study Area. Therefore, train horn noise is not typically part of the existing conditions within the Local Study Area, except for the occasional horn sounding during emergency conditions.

Metrorail Yellow Line weekday rapid transit operations include service between 5:00 AM and 11:30 PM with 8-minute headways during the morning and afternoon rush periods, 12-minute headways during the midday and evening periods, and 20-minute headways during the late-night period. Metrorail trains operate until 1:00 AM on Fridays and Saturdays, with openings at 7:00 AM on Saturday and 8:00 AM on Sunday. Service ends at 11:00 PM on Sunday. WMATA trains do not typically sound their horn unless there are emergency conditions on the dedicated railroad right-of-way.

Sources of noise and vibration associated with the railroad operations include movements of the trains, as well as auxiliary equipment such as radiator cooling fans and on-board heating, ventilation, and air-conditioning equipment operating on passenger coaches and locomotives.

The tracks are continuously-welded-rail (CWR) rail segments and there are many track turnouts. The RO Interlocking (located between the Long Bridge Park and GWMP) and the L'Enfant (LE) Interlocking (located underneath the 12th Street Expressway) are sources of railroad noise and vibration.

Noise Measurement Results

The existing noise environment primarily includes contributions from trains, aircraft operations and traffic. Railroad operations are the predominant source of noise at receptors adjacent to and close-in to the Long Bridge Corridor including the Long Bridge Park (Site NV1), Mount Vernon Trail (Site N2), NPS Parking Lot and DOD Facility (Site NV6), and the Mandarin Oriental Hotel (Site N8). Farther from the Long Bridge Corridor and where there are substantial intervening buildings, traffic noise and aircraft operations are the predominant ambient source such as at the Jefferson Memorial (Sites NV3 and N4) and the George Mason Memorial (Site N5).

Table 11-2 Table 11-2 summarizes the existing ambient noise measurement results and predominant noise sources throughout the Study Area.

The following summarizes the noise measurement locations and results:

- **Site NV1 (Long Bridge Park):** Noise measurements were conducted at the front edge of the 20-foot retaining wall adjacent to the Long Bridge Corridor at approximately 55 feet from the near tracks. The measurements were conducted during the morning peak period and included nine train pass-bys and approximately 20 aircraft operations.
- **Site N2 (Mount Vernon Trail):** Noise measurements were conducted at three locations along the Mount Vernon Trail including locations 225 feet away, 125 feet away, and directly underneath the Long Bridge. The measurements 225 feet from the Long Bridge were conducted at the same time as the measurements at Site NV1 which included nine train pass-bys and approximately 20 aircraft operations.
- **Site NV3 (Jefferson Memorial structure and interior):** Noise measurements were conducted at the base of the structure along the southeastern side of the memorial and within the memorial. The predominant source of ambient sound was traffic on 14th Street Bridge, I-395, and local roadways. Aircraft operations were clearly audible. VRE and Amtrak trains were audible for approximately 20 seconds while passing by the site due to sound from the locomotive. CSXT freight trains were audible throughout the entire duration of the train pass-by, which was generally 1 to 2 minutes long. Audibility logging was performed during the measurements at this site to document the percent of time that different sources of sound were audible. Road noise was constantly audible; trains, aircraft, and pedestrians were audible 9 percent, 30 percent, and 1 percent of the time, respectively. Supplemental measurements were conducted for 30 minutes inside the memorial interior near the Thomas Jefferson statue. A large group of children visited the memorial during this measurement. The ambient sound level was 70 dBA Leq due primarily to sound from the park visitors. Roadway noise and aircraft noise was not typically audible inside the memorial while the large group of children interacted.
- **Site N4 (Jefferson Memorial grounds):** Noise measurements were conducted at the grounds area southeast of the memorial structure. The measurement results were similar to those conducted at Site M3 at the base of the structure.
- **Site N5 (George Mason Memorial):** Noise measurements were conducted at the George Mason Memorial during the afternoon peak-transit period. This location was relatively close to highways including the 14th Street Bridge and I-395 compared to the Long Bridge Corridor. Road noise was constantly audible; aircraft, pedestrians, and birds were audible 43 percent, 2 percent, and 11 percent of the time, respectively. Trains were not audible at this location.
- **Site NV6 (NPS Parking Lot and DOD Facility):** Noise measurements were conducted in the NPS Parking Lot C at a location that is representative of the noise exposure at the DOD Facility on the other side of the tracks. Measurements were conducted for 1 hour during an afternoon peak period with numerous WMATA, VRE, and Amtrak trains as well as roadway noise and aircraft operations. Measurements were also conducted for 1 hour during the midday period, which included WMATA trains, one Amtrak, and one CSXT train.

- **Site N8 (Mandarin Oriental Hotel):** Noise measurements were conducted on the Southwest Footbridge adjacent to the Mandarin Oriental Hotel near the closest point of the building to the Long Bridge Corridor. Measurements during the midday period included two long CSXT trains, one VRE train, and one Amtrak train. During the afternoon peak period, there were a total of five Amtrak and VRE trains. There were no train pass-bys during the nighttime period. The tracks are curved along this segment of the corridor and most trains generated significant wheel squeal, which created high frequency tonal conditions.

Table 11-2 | Existing Ambient Noise Measurement Results

Site Number	Location (Noise Category)	Dist. to Near Tracks (Feet)	Date (Start Time)	Duration	Period	Leq (dBA)	Ldn (dBA)	Predominant Noise Source
NV1	Long Bridge Park (Cat. 3)	55	1/25/2018 (7:19 AM)	1 hour	Morning Peak	70	n/a	<ul style="list-style-type: none"> • Railroad operations • Aircraft operations
N2	Mount Vernon Trail (Cat. 3)	225	1/25/2018 (7:20 AM)	1 hour	Morning Peak	70	n/a	<ul style="list-style-type: none"> • Railroad operations
		125	1/25/2018 (8:22 AM)	30 minutes	Morning Peak	70	n/a	<ul style="list-style-type: none"> • Traffic on George Washington Memorial Parkway
		0	1/25/2018 (8:53 AM)	10 minutes	Morning Peak	72	n/a	<ul style="list-style-type: none"> • Aircraft operations
NV3	Jefferson Memorial (Cat. 1) (base of structure) (inside memorial)	750	1/25/2018 (3:35 PM)	1 hour	Afternoon Peak	64	n/a	<ul style="list-style-type: none"> • Traffic on 14th Street, I-395, and local roadways • Railroad operations • Aircraft operations • Pedestrian noise
		775	1/25/2018 (4:48 PM)	30 minutes	Afternoon Peak	70	n/a	
N4	Jefferson Memorial (Cat. 1) (grounds)	635	1/25/2018 (3:39 PM)	1 hour	Afternoon Peak	64	n/a	<ul style="list-style-type: none"> • Traffic on 14th Street, I-395, and local roadways • Railroad operations • Aircraft operations • Pedestrian noise
N5	George Mason Memorial (Cat. 1)	1200	1/25/2018 (4:50 PM)	1 hour	Afternoon Peak	67	n/a	<ul style="list-style-type: none"> • Traffic on 14th Street, I-395, and local roadways • Aircraft operations
NV6	NPS Parking Lot / DOD Facility (Unknown Use)	70	1/24/2018 (3:54 PM)	1 hour	Afternoon Peak	69	67 ¹	
			1/25/2018 (1:44 PM)	1 hour	Midday	67	65 ¹	<ul style="list-style-type: none"> • Traffic on I-395 • Railroad operations
N8	Mandarin Oriental Hotel (Cat. 2)	85	1/24/2018 (4:45 PM)	1 hour	Morning Peak	67	73 ²	<ul style="list-style-type: none"> • Traffic on 14th Street, I-395, and local roadways
			1/24/2018 (12:14 PM)	1 hour	Midday	76		<ul style="list-style-type: none"> • Railroad operations
			1/24/2018 (10:18 PM)	1 hour	Night	64		<ul style="list-style-type: none"> • Aircraft operations

Source: VHB, 2018

Notes: 1 - Ldn estimated according to FTA guidance for measurements conducted between 7 AM and 7 PM.

2 - Ldn estimated according to FTA methods for three 1-hour measurements during the night, morning peak, and midday periods.

n/a – Ldn is not applicable for Category 1 or Category 3 land uses

Vibration Measurement Results

Vibration measurements were conducted at four locations to determine the maximum vibration levels from train pass-bys. **Table 11-3** presents the vibration site, the type of sensitive use, the accelerometer location, distance to the near tracks, overall energy-average vibration level, and the maximum vibration level in any one-third-octave band between 4 and 400 Hz. The following summarizes the vibration measurement locations and results:

- **Site NV1 (Long Bridge Park):** Although Long Bridge Park is not sensitive to vibration, measurements were conducted at this location (Site NV1) to characterize the vibration levels from train operations at a range of distances from the tracks with an approximately 20-foot-tall retaining wall between the tracks and the measurement positions. Overall vibration levels at this site were 63 VdB or lower at all measurement locations.
- **Site NV3 (Jefferson Memorial Structure):** Vibration measurements were conducted at the Jefferson Memorial structure (Site NV3) which is approximately 740 feet or farther from the Long Bridge Corridor. Since the memorial is an open outdoor facility, the site is not sensitive to vibration as it relates to human annoyance; however, as a National Historic Landmark, the structure is sensitive to potential structural damage. The maximum overall vibration levels during a CSXT freight train pass-by ranged from 54 to 64 VdB at the memorial structure.
- **Site NV6 (NPS Parking Lot/DOD Facility):** Vibration measurements were conducted at NPS Parking Lot C across the tracks from the DOD Facility where there may be vibration-sensitive uses. Measurements were conducted of VRE, Amtrak, CSXT, and WMATA trains. The DOD Facility is approximately 70 feet from the tracks. At a distance of 70 feet from the tracks, VRE, Amtrak, and CSXT trains generated an energy-average overall vibration level of 73 VdB.
- **Site V7 (Mandarin Oriental Hotel):** Vibration measurements were conducted at four locations near the hotel adjacent to the Long Bridge Corridor. Overall energy-average vibration levels were 68 VdB at the measurement located 40 feet from the abutment, which is representative of the vibration levels at the closest exterior hotel façade.

Table 11-3 | Vibration Measurement Results

Vibration Site	Location (Sensitive Use)	Accelerometer Location	Distance to Near Tracks (feet)	Overall Vibration Velocity (VdB)	Maximum One-Third-Octave Band Vibration Velocity (VdB)
NV1	Long Bridge Park (No Sensitive Use)	Top of retaining wall	55	63	57
		Top of retaining wall	85	60	55
		Ground	165	61	53
NV3	Jefferson Memorial (National Monument)	Top of perimeter wall	740	60	57
		Base of monument	775	64	61
		Exterior column	785	59	58
		Interior column	795	54	51
NV6	NPS Parking Lot DOD Facility (Unknown Sensitivity)	Ground	45 ¹	77	72
		Ground	70 ¹	73	69
		Ground	90 ¹	68	64
		Ground	105 ¹	68	61
		Ground	15 ²	73	70
		Ground	35 ²	68	63
		Ground	55 ²	67	60
		Ground	75 ²	67	60
V7	Mandarin Oriental Hotel (Residential Use)	Base of bridge column	12	74	68
		Base of abutment	12	80	74
		40 feet from abutment	52	68	60
		100 feet from abutment	112	65	59

Source: VHB, 2018

Notes: 1 – Distances to near railroad tracks including VRE, Amtrak, and CSX train operations

2 – Distances to near WMATA train tracks

12.0 Aesthetics and Visual Resources

12.1. Overview

Visual and aesthetic resources include features of both the built and natural environment that together comprise the visual environment. Examples of visual and aesthetic resources surrounding Long Bridge include parks, natural areas, trails, parkways, scenic features, open vistas, terrain, and water bodies. Historic or urban core districts are also considered visual resources. These visual resources create visual and aesthetic qualities that define specific locations in the District and Arlington County.

The following terminology is used to describe visual resources, character, and quality:³⁸⁹

- **Viewers:** Neighbors who can see the proposed Project and travelers who would use it.
 - **Neighbors:** Viewers who occupy, or will occupy, land adjacent or visible to the Project.
 - **Travelers:** Viewers who use the existing transportation infrastructure, or would use the transportation infrastructure resulting from the proposed Project.
- **Visual Resources:** Component of the natural, cultural, or Project environments that is capable of being seen. These include:
 - **Natural Visual Resources:** The land, geologic features, water, vegetation, and animals that compose the natural environment.
 - **Cultural Visual Resources:** The buildings, structures, objects, site, districts, and artifacts that compose the cultural environment.
 - **Project Visual Resources:** The geometrics, structures, and fixtures that compose the Project environment.
- **Visual Quality:** An assessment of what viewers like and dislike about visual resources that compose the visual character of a particular scene. Different viewers may evaluate specific visual resources differently based on their interests. Elements of visual quality include:
 - **Natural Harmony:** What a viewer likes and dislikes about the natural environment. The viewer labels the visual resources of the natural environment as being either harmonious or inharmonious.
 - **Cultural Order:** What a viewer likes and dislikes about the cultural environment. The viewer labels the visual resources of the cultural environment as being either harmonious or inharmonious.
 - **Project Coherence:** What the viewer likes and dislikes about the Project environment. The viewer labels the visual resources of the Project environment as being either coherent or incoherent.

³⁸⁹ All definitions are adapted from FHWA's Guidelines for the Visual Impact Assessment of Highway Projects, unless otherwise noted. FHWA-HEP-15-029. Guidelines for the Visual Impact Assessment of Highway Projects. January 2015. Accessed from https://www.environment.fhwa.dot.gov/env_topics/other_topics/VIA_Guidelines_for_Highway_Projects.aspx. Accessed May 9, 2018.

- **Viewshed:** All surface area visible from a particular location or sequence of locations, such as a trail.
- **Area of Visual Effect (AVE):** The area in which views of the Project would be visible as influenced by the presence or absence of intervening topography, vegetation, and structures.
- **Key Viewpoints:** A location from which a viewer can see either iconic or representative landscapes.
- **Viewer Sensitivity:** The degree to which viewers are sensitive to changes in the visual character of visual resources. This is the consequence of two factors: viewer exposure and viewer awareness.
- **Viewer Exposure:** Viewer exposure is a measure of proximity (the distance between viewer and the visual resource being viewed), extent (the number of viewers viewing), and duration (the length of time visual resources are viewed). The greater the exposure, the more viewers will be concerned about visual impacts.
- **Viewer Awareness:** Viewer awareness is a measure of attention (level of observation based on routine and familiarity), focus (level of concentration), and protection (legal and social constraints on the use of visual resources). The greater the attention, the more viewers will be concerned about visual impacts.
- **Visual Character:** The description of the visible attributes of a scene or object typically using artistic terms such as form, line, color, and texture.

12.2. Regulatory Context and Guidance

The following laws, regulations, and agency jurisdiction and management guidance are pertinent to aesthetic and visual resources. Key regulations and guidance that are most relevant to the Long Bridge Project are listed below.

12.2.1. Aesthetics and Visual Resources Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- National Scenic Byways³⁹⁰
- U.S. Department of Transportation (USDOT) Act (Section 4[f])³⁹¹
- USDOT, Federal Highway Administration (FHWA), Order 5610.4. *Procedures for Considering Environmental Impacts*. Docket No. EP-1, Notice 5 (May 1999)³⁹²

³⁹⁰ 23 USC 162

³⁹¹ 49 USC 303

³⁹² 64 FR 28545

- EO 1862 of November 28, 193: Ordering that New Structures Erected in District of Columbia and Other Matters Related to Art Be Submitted to Commission of Fine Art
- EO 11593 of May 13, 1971: Protection and Enhancement of the Cultural Environment³⁹³
- National Historic Preservation Act (NHPA) of 1966³⁹⁴
- Federal Land Policy and Management Act of 1976³⁹⁵
- National Park Service (NPS), Forests, and Public Property³⁹⁶
- Shipstead-Luce Act of 1930³⁹⁷
- The Height of Buildings Act of 1910³⁹⁸

Relevant Federal Guidance:

- National Capital Planning Commission (NCPC), Comprehensive Plan for the National Capital – Federal Elements³⁹⁹
- NCPC, Monumental Core Framework Plan⁴⁰⁰
- NCPC, Southwest Ecodistrict Plan⁴⁰¹
- NPS, National Mall Plan⁴⁰²
- FHWA's Guidelines for the Visual Impact Assessment of Highway Projects^{403,404}

³⁹³ EO 11593

³⁹⁴ 16 USC 470

³⁹⁵ 43 USC 1701

³⁹⁶ 36 CFR 1-99

³⁹⁷ 40 USC 121

³⁹⁸ The Height of Buildings Act of 1910. Accessed from https://www.ncpc.gov/heightstudy/docs/Historical_Background_on_the_Height_of_Buildings_Act_%28draft%29.pdf. Accessed May 1, 2018.

³⁹⁹ National Capital Planning Commission (NCPC). 2016. Comprehensive Plan for the National Capital, Federal Elements. Accessed from <https://www.ncpc.gov/plans/compplan/>. Accessed January 12, 2018.

⁴⁰⁰ NCPC. 2009. Monumental Core Framework Plan. Accessed from <https://www.ncpc.gov/plans/framework/>. Accessed January 12, 2018.

⁴⁰¹ NCPC. 2013. Southwest Ecodistrict Plan. Accessed from <https://www.ncpc.gov/initiatives/swecodistrict/>. Accessed January 12, 2018.

⁴⁰² National Mall and Memorial Parks. 2010. National Mall Plan. Accessed from <https://www.nps.gov/nationalmallplan/National%20Mall%20Plan.html>. Accessed January 12, 2018.

⁴⁰³ FHWA. 2015. Guidelines for the Visual Impact Assessment of Highway Projects. Accessed from https://www.environment.fhwa.dot.gov/env_topics/other_topics/VIA_Guidelines_for_Highway_Projects.aspx. Accessed January 12, 2018.

⁴⁰⁴ While the FHWA is not a regulatory body for railroad projects, it is considered an expert resource regarding visual impact assessments due to their extensive documentation of visual resources, impacts, and mitigation measures. Therefore, the analysis of visual quality and impacts draws heavily on FHWA guidance.

12.2.2. Aesthetics and Visual Resources State Laws, Regulations, and Other Guidance

Relevant State and Local Laws and Regulations:

- District of Columbia Municipal Regulations (DCMR), Zoning Regulations Special Purpose Zones⁴⁰⁵
- The Historic Landmark and Historic District Protection Act of 1978, as amended through October 1, 2016⁴⁰⁶
- Arlington County Code⁴⁰⁷

Relevant State and Local Guidance:

- Virginia Department of Historic Resources, Assessing Visual Effects on Historic Properties⁴⁰⁸
- Comprehensive Plan for the National Capital – District Elements⁴⁰⁹
- District of Columbia Office of Planning (DCOP), Maryland Avenue SW Small Area Plan⁴¹⁰

Of these resources, the Comprehensive Plan for the National Capital – Federal Elements, in particular, provide detailed guidance on viewsheds and visual quality that apply to the Long Bridge Corridor's setting. Relevant priorities articulated in the plan's Urban Design Element and Urban Design Element Technical Addendum include:

- Protecting the visual character and viewsheds of the National Capital's topographic bowl, consistent with the L'Enfant Plan;
- Protecting the natural beauty of the National Capital by preserving its rich and varied natural setting, including the region's waterways, hillsides, parks, and tree canopy;
- Maintaining an unobstructed, attractive viewshed toward memorials and monuments on the National Mall;
- Reclaiming Maryland Avenue SW as a grand boulevard that links the U.S. Capitol to the Jefferson Memorial by enhancing existing public spaces and reconnecting the street grid; and
- Preserving panoramic viewsheds from topographic ridgelines that provide sweeping views of the capital's urban and natural landscape.

⁴⁰⁵ DCMR 11-K1-K9

⁴⁰⁶ DC Law 2-144

⁴⁰⁷ Arlington County Code

⁴⁰⁸ Virginia Department of Historic Resources. Undated. Assessing Visual Effects on Historic Properties. Accessed from https://www.dhr.virginia.gov/pdf_files/Assessing_Visual_Effects_JUN10.pdf. Accessed January 12, 2018.

⁴⁰⁹ District of Columbia Office of Planning (DCOP). 2006. Comprehensive Plan for the National Capital, District Elements. Accessed from <https://www.ncpc.gov/plans/compplan/>. Accessed January 12, 2018.

⁴¹⁰ DCOP. 2015. Maryland Avenue SW Small Area Plan. Accessed from <https://planning.dc.gov/publication/maryland-ave-small-area-plan>. Accessed January 12, 2018.

12.3. Study Area

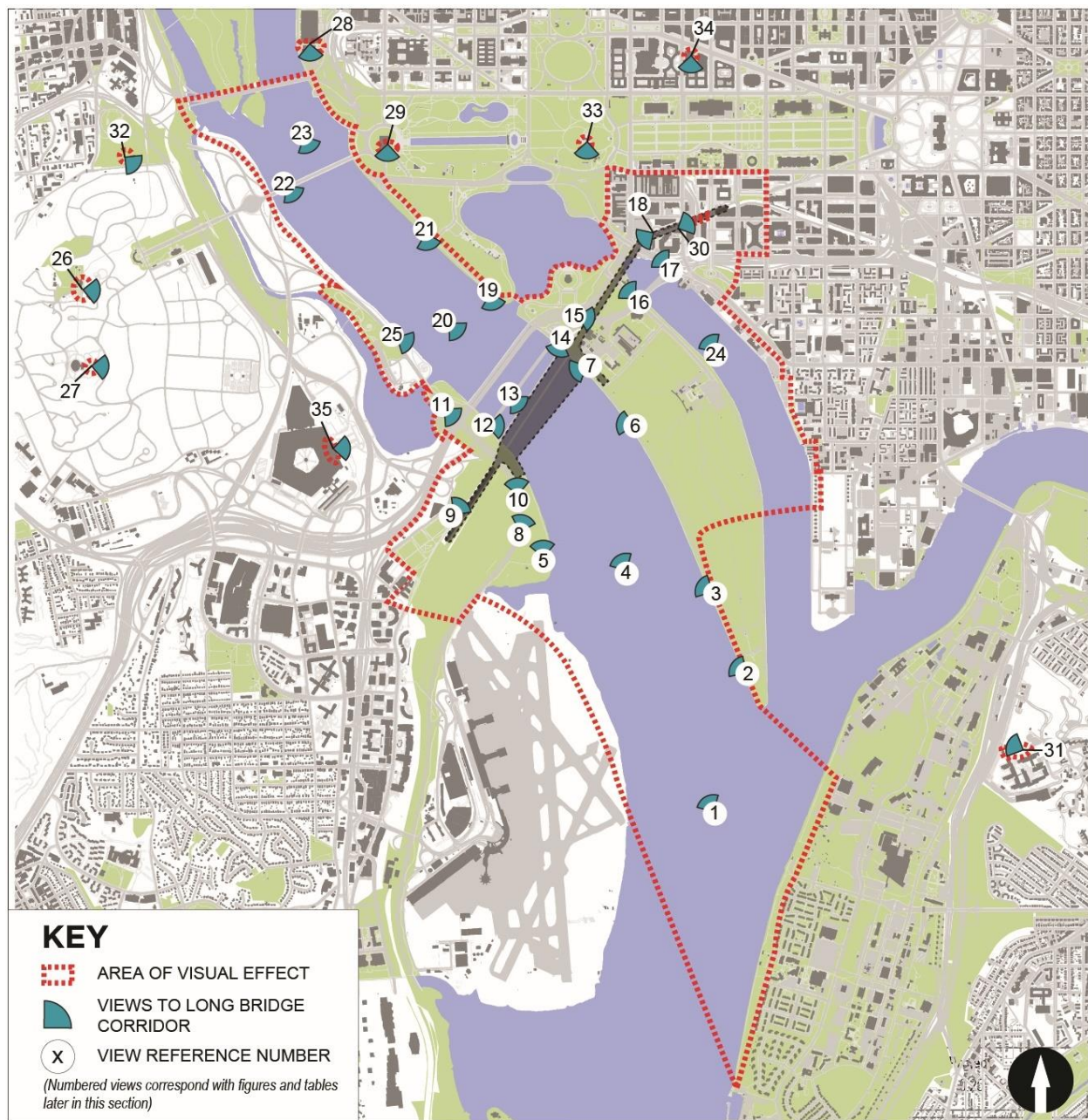
The Study Area for aesthetics and visual resources corresponds with the AVE identified as part of field surveys (**Figure 12-1**). The Study Area also corresponds directly with the Area of Potential Effects (APE) established in **Section 13.0, Cultural Resources**, for the assessment of effects to cultural resources. This Local Study Area extends beyond the Long Bridge Project footprint to encompass the viewsheds, viewpoints, and areas from which the existing Project Site is visible. The majority of the Study Area is situated within a contiguous area that generally includes the Potomac River and land immediately adjacent to the river to the north and south; this area is generally bounded to the north by the Roosevelt Bridge and to the south by the Blue Plains wastewater treatment facility. The Study Area also includes a Regional Study Area of additional, isolated areas in the outer extents of the area surveyed, where the Long Bridge Corridor is visible from a distance in select locations, due to the higher elevation of these viewpoints. While these viewshed sites were excluded from the APE due to the limited nature of views of the Long Bridge Corridor within each larger historic site, they are included as part of the Study Area for aesthetics and visual resources.

To establish the boundaries of the AVE (hereafter referred to as the Study Area) per FHWA guidelines for visual impact assessment, Esri ArcGIS, Google Earth, and Google Maps were employed to identify the reasonable outer extents of the area within which the Project Area could be visible.⁴¹¹ These reasonable outer extents were identified based on factors that included potential viewsheds, including views along and across water bodies; areas of higher elevation, including topographic high points, elevated roadways, and other publicly-accessible elevated viewing locations; vegetation coverage; adjacent urban conditions, including the height, density, and distribution of buildings; and surrounding street patterns and alignments. The Study Area boundaries also took into account seasonal variations, including winter views when leaves are off the trees.

Subsequently, field surveys were conducted to test and document potential views, viewsheds, and sightlines in the surrounding area. Ten separate field surveys (on June 30, July 3, September 14, September 15, September 19, September 22, November 14, November 15, November 17, and November 28, 2017) were conducted to test and document the visibility of the Long Bridge Project Area from multiple and various geographic areas. Field surveys included windshield surveys by automobile and on-foot site visits, as well as tours of downstream and upstream areas of Potomac River by boat (District Wharf Water Taxi) to survey views from the river.

⁴¹¹ Guidelines for the Visual Impact Assessment of Highway Projects. 2015.

Figure 12-1 | Area of Visual Effect (Study Area) with Representative View Locations (see Table 12-1 for view reference numbers and descriptions)



While the field survey emphasized ground-level, publicly accessible viewpoints, selected above-ground yet publicly accessible locations at prominent buildings and sites (such as the Kennedy Center upper and lower terraces, the Old Post Office Tower, and Netherlands Carillon) were also surveyed to confirm the visibility of Long Bridge from these points. The existence of views toward Long Bridge and the Long Bridge Corridor were documented through digital photography, field notes, and mapping. Separate nighttime site visits were conducted to document existing sources of light emissions.

Nighttime conditions and existing light sources near the Study Area were qualitatively documented and photographed during nighttime field surveys to surrounding sites.

12.4. Methodology

An annotated visual impact analysis map was developed indicating the general locations of viewsheds and viewpoint locations for various types of viewers. Continuous viewpoints were identified along the George Washington Memorial Parkway (GWMP).

A Consulting Parties meeting was held on November 15, 2017, to confirm resources for evaluation. At the meeting, viewshed and viewpoint locations were reviewed for various viewers, along with locations that require nighttime or seasonal conditions. Background information, imagery, and “street views” were organized to help facilitate the conversation.

A series of field visits were conducted to document the Study Area. The existing visual character was documented through:

- Description of viewers and viewer sensitivity.
- Annotated visual impact analysis map with viewshed and viewpoint locations, including field observations. Travel speeds were documented when necessary to help determine the cone of vision.
- Photographs showing views at locations from which the Project will be visible, especially those that represent viewsheds that are visually, naturally, or culturally significant.
- Photographs showing resources within the Study Area, and a description of their relationship to the Project.
- Photographs and written description of existing light sources, and a description of levels in the Study Area.

12.5. Affected Environment

The existing visual quality of the affected environment is determined by the existing environment—including natural features, land use and built elements, and immediate project environment—and by the population that resides in, visits, or travels through the area. To assess the potential visual impacts resulting from the Project, both the proposed physical changes to the environment and the sensitivity of different types of viewers to these changes are evaluated as part of this assessment.

The Long Bridge Corridor falls generally within one of the “Preeminent Viewsheds and View Corridors” identified by the Urban Design Element of the Comprehensive Plan for the National Capital – Federal Elements: the primary north-south vista from the White House to the southern horizon. The Urban Design Element Technical Addendum further notes that this vista “provides the strong visual connection from the White House along the National Mall to the Jefferson Memorial and southward to the horizon.” Moreover, this axis serves as an “essential orientation point that establishes the spatial order of the city and visual quality within the Monumental Core.” The National Mall, the White House, the Washington Monument, the Jefferson Memorial, the Tidal Basin, the Potomac River, and the Woodrow

Wilson Bridge are identified as the most visually prominent structures within this panoramic, scenic setting.

Further, the Technical Addendum states “the form and character of the built and natural elements within and around this vista are important parts of how the public experiences some of our nation’s most beloved memorials and public buildings, today and in the future” and that “Arlington County, Virginia, plays an integral role in the urban design framework of the National Capital Region, including this particular vista. The Crystal City neighborhood serves as part of the visual backdrop of this primary vista.” It notes that additional important resources located within this vista include the GWMP, Ronald Reagan Washington National Airport, the Pentagon, and the Air Force Memorial.^{412,413}

The following documents the findings of the field survey. Accompanying photographs (**Figure 12-2** through **Figure 12-34**) illustrate existing views of the Long Bridge Corridor and correspond with the locations identified in **Figure 12-1** and described in **Table 12-1**. These locations were selected to document viewpoints from representative areas within the Study Area, in order to illustrate the visibility of the Long Bridge Corridor. These points are distributed geographically throughout the Study Area.

12.5.1. Existing Population and Viewers

The Study Area population on both sides of the Potomac River includes neighbors, visitors, and a range of travelers, all of whom constitute the viewers of the Project Area. Viewer sensitivity to changes in the visual environment is dependent on individual viewer preferences and is the consequence of two factors, viewer exposure and viewer awareness:

- **Viewer exposure** is a measure of proximity (the distance between a viewer and the visual resource being viewed), extent (the number of viewers viewing), and duration (the length of time visual resources are viewed). The greater the exposure, the more viewers will be concerned about visual impacts.
- **Viewer awareness** is a measure of attention (level of observation based on routine and familiarity), focus (level of concentration), and protection (legal and social constraints on the use of visual resources).

Viewer sensitivity is assumed to remain constant over time, given that viewers will continue to engage in the same activities in the future as they do now.

12.5.2. Neighbors

Neighbors of the Project Area include those who live or work within the Study Area as well as those who visit the area for recreation and tourism. Of these neighbors, those likely to be most sensitive to changes in visual character are those who live in the Study Area and those who routinely visit the area for recreation and to enjoy the scenery. There are no residential neighbors within the Study Area and few residential neighbors within 0.5 miles. In Arlington County, the closest residential neighbors are those in multifamily residential buildings along 10th Street South, south of Long Bridge Park. In the District, the

⁴¹² Federal Elements of the Comprehensive Plan for the National Capital. 2016.

⁴¹³ Federal Elements of the Comprehensive Plan for the National Capital. 2016.

closest residential neighbors include residents of the newly constructed first phase of the District Wharf development and residents of the Southwest community east of Banneker Park in the area bounded by I-395, 4th Street SW, and I Street SW.

Recreational neighbors—those who provide or participate in recreational activities, including tourism—include visitors to parklands, trails, and other recreational or tourist destinations within the Study Area, as well as those who work at recreational facilities in or near the Study Area. Portions of numerous such destinations fall within the Study Area, including Arlington County’s Long Bridge Park, the GWMP and Mount Vernon Trail, Gravelly Point Park, and Federal parkland along the southern edges of East Potomac Park and West Potomac Park.⁴¹⁴ In addition, portions of the Long Bridge Corridor are visible along Maryland Avenue SW. Distant views of the Long Bridge Corridor are possible from Arlington National Cemetery; Arlington House, The Robert E. Lee Memorial; and the upper terrace of the Kennedy Center. In general, recreational viewers value continuity in visual character and are likely to be highly sensitive to changes in the surrounding environment that affect visual quality. Recreational neighbors near the Project Area—such as locations along the Potomac River waterfront and immediately adjacent to the railroad tracks—are likely to have the greatest sensitivity to changes in visual character, while those viewing the Project Area from greater distances are likely to have lower sensitivity.

Other neighbors in the District within the Study Area include retail businesses and office building tenants in the L’Enfant Plaza and Southwest Waterfront areas, as well as employees and guests of the Mandarin Oriental Hotel, those visiting the piers of the District Wharf development, and boat-related businesses on the Washington Channel. The eastern end of the Study Area also includes a small portion of the Blue Plains wastewater management facility, the employees of which also constitute neighbors with distant views of the Long Bridge Corridor.

12.5.3. Travelers

Travelers through the Study Area include vehicular travelers on surrounding roadways (I-395, GWMP, 14th Street Bridge, and local streets in the District and Arlington County); Amtrak and Virginia Railway Express (VRE) railroad passengers using the Long Bridge Corridor; passengers on the Metrorail bridge that runs parallel to the Long Bridge Corridor; pedestrians and bicyclists on sidewalks, trails, and bicycle facilities proximate to the Long Bridge Corridor; and boat travelers on the Potomac River (including water taxis, sightseeing boats for tourists, and a range of public and private vessels). The largest subset of these travelers would be expected to be primarily commuter, with a smaller subset of touring travelers visiting the Study Area for recreation, leisure, and tourism.

Travelers’ sensitivity to the changes in visual character would be expected to vary depending on the mode of travel. The most sensitive viewers would be those afforded continuous and up-close views of the Long Bridge Corridor—pedestrians and bicyclists along Potomac River trails and along the railroad corridor in Crystal City as well as those traveling by boat along the Potomac River. In addition, Metrorail travelers are also likely to be sensitive to changes in visual character during the brief passage across the Potomac River on the adjacent parallel bridge, due to the up-close nature of these views and the repeated nature of these views as part of daily commutes. Travelers by motor vehicles would be expected to be less sensitive to visual changes due to the relatively lower frequency of potential views

⁴¹⁴ NPS considers the GWMP to be parkland; drivers and vehicular passengers are considered, therefore, to be park visitors.

from surrounding roadways and the short duration and fleeting nature of these views. Under the allowable speed of travel along roadways such as I-395 and the GWMP under normal conditions, the fleeting nature of views, and the location of the Long Bridge Corridor outside the primary field of view for vehicles in some locations, travelers by motor vehicle are afforded limited opportunities to take in views of the corridor. However, given the regular traffic congestion that occurs throughout the day along I-395 and, to a lesser extent along the GWMP, travelers may be expected to have more sustained views during such conditions if these views are not obstructed by adjacent vehicles.

While views of the Long Bridge and Long Bridge Corridor are generally limited for those visiting and traveling the GWMP, between the Lyndon Baines Johnson Memorial Grove (LBJMG) and Gravelly Point there are several intermittent views of the Potomac River bridge trestle or of the Long Bridge Corridor railroad overpass and stone abutments. The Long Bridge trestle, which is partially or mostly obscured by trees and topography along the GWMP, is most visible from areas near Gravelly Point and just south of Lady Bird Johnson Park. Between the LBJMG and Gravelly Point, motorists cannot see the bridge trestle, yet portions of the bridge's span are visible to varying degrees above and below the spans of the 14th Street and Metrorail bridges.

12.5.4. Existing Visual Quality

Visual quality is an assessment of what viewers like and dislike about the visual resources that compose the visual character of a particular scene. Viewers may evaluate specific visual resources differently based on their particular interests, sensitivities, and individual reactions to the landscape around them. For the purpose of analyzing aesthetic and visual impacts, visual quality can be assessed by considering the three elements that comprise visual quality:

- **Natural Harmony:** What a viewer likes and dislikes about the natural environment. The viewer interprets the visual resources of the natural environment as being either harmonious or inharmonious.
- **Cultural Order:** What a viewer likes and dislikes about the cultural environment. The viewer interprets the visual resources of the cultural environment as being either orderly or disorderly.
- **Project Coherence:** What the viewer likes and dislikes about the Project environment. The viewer interprets the visual resources of the Project environment as being either coherent or incoherent.

What follows is an assessment of existing visual quality according to these three elements. Considered together, these elements enable an assessment of overall landscape composition and vividness, which forms the basis for the analysis of impacts to aesthetics and visual quality resulting from the Proposed Action.

12.5.5. Natural Harmony

The degree of natural harmony that exists in a landscape is derived from the composition of natural visual resources, which include the land, geologic features, water, vegetation, and animals that comprise the natural environment. Natural visual resources in the Study Area include the Potomac River waterway and riparian edge, adjacent water bodies, trees, and other vegetation in the Study Area; the topographic conditions of the Study Area; and parkland and open space adjacent to the Potomac River and along the GWMP.

The Study Area includes the Potomac River, which constitutes the most prominent natural element within the Study Area and is one of the area's greatest contributors to natural harmony. As noted in the Urban Design Element of the Federal Elements of the Comprehensive Plan for the National Capital, "there are excellent wide and distant views up and across the Potomac River that reveal the natural extent of the local topography and reinforce the Monumental Core's horizontal character."⁴¹⁵ The Long Bridge Corridor also crosses the western portion of the Washington Channel, which parallels the Potomac River between East Potomac Park and the District's Southwest waterfront.

Topographically, the Project Area sits within the central low point of the topographic bowl formed by the Arlington Hills, Anacostia Hills, and the Florida Avenue escarpment. As the Federal Urban Design Element notes, these hillsides not only serve as backdrops for notable views and vistas in or around the national capital, but also "their slopes provide public outlooks for appreciating the city."⁴¹⁶

Topography within the Study Area itself is largely flat to gently sloping, with highest elevations located at Long Bridge Park, immediately west of the Long Bridge Corridor in Arlington County and in the L'Enfant Plaza area of the District, where elevations increase north of the Washington Channel. As such, topography within the Study Area contributes low to moderate levels of natural harmony.

Other notable natural visual resources include the natural areas along the northern edges of both East and West Potomac Parks, where a continuous row of trees provides a green and natural edge for the park and the northern banks of the Potomac River. Similarly, along the southern banks of the Potomac River, scattered trees interspersed with expanses of open lawn define the natural character of the land between the river and the GWMP. The tree canopy in this area is most dense closest to the Long Bridge Corridor, east and west of the railroad tracks. Additional tree canopy lines and visually buffers both sides of the Long Bridge Corridor as it bisects East Potomac Park before crossing the Washington Channel. Further upstream, the western extent of the Study Area includes a portion of Little Island, an uninhabited and entirely wooded island that is accessible only by boat.

A high level of natural harmony also exists along the southern end of the Project Area, where the Long Bridge Corridor is bordered to the east by the Roaches Run Waterfowl Sanctuary. A row of trees and one larger stand of trees line the eastern edge of the railroad tracks along the corridor's southern length, while the sanctuary's lake (frequented by bird species such as osprey, green heron, red-winged blackbird, and mallard) is intermittently visible further to the east. Also to the east, the green character of the recreational facilities and open space at Long Bridge Park, east of the Long Bridge Corridor—while man-made, rather than natural, and recently constructed—contributes to natural harmony to a lesser degree by virtue of the green and open character of the park's active and passive recreation spaces.

Natural harmony is lowest at the corridor's northern end in the District, where the surrounding landscape is dominated by urban development, transportation infrastructure and parking lots. Along the Potomac River, the close proximity of multiple bridges crossing the Potomac diminishes the natural

⁴¹⁵ Federal Elements of the Comprehensive Plan for the National Capital. 2016.

⁴¹⁶ Federal Elements of the Comprehensive Plan for the National Capital. 2016.

harmony of the river in the vicinity of the Project Area by interrupting the natural visual character of the river with manmade infrastructure that obstructs views along the river.

12.5.6. Cultural Order

The composition of the visual resources of the cultural environment—buildings, structures, objects, sites, districts, and artifacts—determines the extent of cultural order in a landscape. Cultural visual resources within the Study Area are largely limited to the riverfront edges of urban development immediately proximate to the Potomac River (including portions of the District’s Southwest waterfront and the Blue Plains wastewater treatment facility), as well as urban development in a portion of the L’Enfant Plaza and Southwest waterfront areas of the District, where the Long Bridge Corridor curves northward into these areas. The Monumental Core and the cultural landscapes of the GWMP and National Mall and Memorial Parks are also key features of the cultural order within the Local Study Area. Monuments such as the Washington Monument are prominent as part of the viewshed.

Buildings within the Study Area include the multi-story Mandarin Oriental Hotel and Federal Communications Commission buildings, both relatively recent construction; the Washington Marina (a two-story brick structure); and docks where charter boats are moored. The Study Area also includes the southernmost tips of the piers that extend from the newly constructed first phase of the District Wharf mixed-use development along the Washington Channel. At the northern end of the Project Area, the Study Area includes a portion of Maryland Avenue SW that includes the upper-rear side of the Mandarin Oriental Hotel and mixed-use office buildings lining the circular terminus of Maryland Avenue SW. Further north and east, opposite the point at which the Long Bridge Corridor reemerges from underground, additional multi-story office buildings line the south side of Maryland Avenue SW. Streetscapes in this area consist of a mix of concrete and brick sidewalks, depending on the street and block.

Given the variety of architectural styles and the fragmented nature of development in this portion of the District, much of the urban development within the Study Area lacks a cohesive order. The exception is the circular terminus of Maryland Avenue SW (known as the Portals development), where a coordinated architectural style, distribution of buildings, a central plaza with landscaping, uniform brick sidewalks, and planters lend this area a greater sense of cultural order. While some of Portals’ building facades are anchored by Post-Modernist design principles, which tend to be nondescript, the streetscape is well maintained and aesthetically pleasing. Both the Southwest Ecodistrict Plan and the Maryland Avenue SW Small Area Plan envision the continuation of the Maryland Avenue SW viewshed in the future.

Further afield from the Project Area, in the outer extents of the Study Area, a number of architecturally and historically significant structures offer distant views of the Long Bridge Corridor, due to their locations at topographical high points or the presence of elevated viewing platforms. These include the Lincoln Memorial and Kennedy Center Upper Terrace; the top of the Washington Monument; the top of the Old Post Office Tower; the top of the Netherlands Carillon; Arlington House, The Robert E. Lee Memorial; and St. Elizabeths West Campus. While architecturally and visually significant, these structures lend limited cultural order to the visual environment of the Long Bridge Corridor, due to their distance from the site. In summary, the following significant monuments and memorials within the monumental core offer views of the Long Bridge Corridor: Lincoln Memorial (viewing platform), Washington Monument (top); Netherlands Carillon (top); and Arlington House, The Robert E. Lee Memorial and the Tomb of the Unknown Soldier within Arlington National Cemetery.

Outside the Study Area, yet significant to the viewer's experience and overall cultural order of the Long Bridge Corridor's setting, the Jefferson Memorial and, less prominently, the U.S. Capitol are visible from portions of the Project Area. These landmarks of the Monumental Core, while not offering direct views of the Long Bridge Corridor, exemplify the "embracing in one view the whole extent" that Pierre L'Enfant emphasized in his plan for Washington.⁴¹⁷ Similarly, the skylines of L'Enfant Plaza, the Southwest waterfront and Crystal City serve as prominent backdrops to views across the Potomac River yet do not offer ground-level, publicly accessible views of the Long Bridge Corridor.

No buildings are currently located within the Study Area at the southern end of the Project Area; however, Arlington County plans to construct a new aquatic facility immediately adjacent to the Long Bridge Corridor at Long Bridge Park.

Other notable structures within the Study Area include the bridges crossing the Potomac River, including the Metrorail bridge that runs adjacent to the Long Bridge Corridor, the 14th Street Bridge, the Arlington Memorial Bridge, and the Theodore Roosevelt Bridge. Of these structures, the Arlington Memorial Bridge—with its stone arches, Neoclassical masonry, steel bascule span, and monumental sculptures—is the most architecturally significant, while the other bridges have more utilitarian designs. Collectively, this sequence of bridge crossings provides a sense of order to views upstream and downstream along the river. It also creates a tunnel effect for travelers on the GWMP.

Finally, existing transportation infrastructure—in particular the elevated portions of I-395, the 12th Street Expressway, and the ramp to L'Enfant Plaza SW and 14th Street SW—largely detracts from the sense of order in the landscape, due to the extent to which it bisects and fragments surrounding urban development.

12.5.7. Project Coherence

Design quality is a product of the organized coherence between material, forms, and functions of a corridor. As it passes over the Potomac River, the Long Bridge Corridor has visual coherence as a continuous railroad structure with a utilitarian but distinctive architectural design that includes an identifiable trestle. While the architectural design of this portion of the corridor reflects the bridge's utilitarian purpose of providing a railroad connection between the District and Virginia, whatever architectural coherence exists is diminished by the rusting and graffiti-marked face of the bridge. North and south of the river, the corridor loses visual coherence, due to its fleeting visibility from roadways, buildings, and public spaces; its varying design and exterior color; and additional locations with graffiti (most prominently where it crosses I-395). Moreover, the transition from below- to above-ground portions along Maryland Avenue SW further detracts from the Project's overall visual coherence, which fragments the urban fabric and further reduces the corridor's visual continuity.

12.5.8. Landscape Composition and Vividness

Overall, the moderate to high levels of visual composition and vividness of the Long Bridge Corridor's Potomac River setting stems from the harmonious natural character of its setting within the Potomac River corridor and from its prominent location within the topographic bowl of the National Capital area, where notable monuments, memorials, and visual landmarks of the Monumental Core are visible in the

⁴¹⁷ Federal Elements of the Comprehensive Plan for the National Capital. 2016. Page 19.

distance. The Study Area is within the MVMH Cultural Landscape, an intentionally designed landscape meant to provide a scenic environment for travelers along the GWMP/MVMH. The Study Area's vividness is diminished north and south of the river by the dominance of transportation infrastructure, by the visual character of the Project Corridor itself, and by the discontinuous and fleeting nature of the Long Bridge Corridor's visual presence, as it moves through portions of the District and Arlington County.

12.5.9. Existing Views and Viewsheds

The visual character of the Study Area is defined by existing views along and across the Potomac River as well as those from surrounding streets, public spaces, and distant points at higher elevations. The viewsheds within and along the edges of the topographic bowl are particularly significant, culturally and historically, given the importance placed on these views by the 18th century L'Enfant Plan and the 1901 McMillan Plan.

In general, the clearest and most significant views of the Long Bridge occur near the Potomac River and at select locations where the corridor crosses major roadways or passes beneath the street network. While the Long Bridge Corridor is visible from a distance upstream, downstream, and higher elevations, it is generally more difficult to discern the visual character of the corridor from these points.

The field survey and photographic documentation were used to determine visibility of the Long Bridge from specific vantage points. This analysis also considered whether the Project Area was clearly visible from a specific exterior vantage point or publicly accessible plaza or viewing platform. The view was sufficiently limited in these locations to not warrant expanding the Study Area to encompass the entirety of each site (for example, Long Bridge was visible from Arlington House, The Robert E. Lee Memorial and the Tomb of the Unknown Soldier, but not from the entirety of Arlington National Cemetery). Interiors of buildings were excluded from consideration. All viewshed sites are also historic properties, so there may be potential for impacts to these properties from the implementation of the Long Bridge Project. The viewsheds identified for analysis initially included:

- The Kennedy Center;
- The Washington Monument;
- The Lincoln Memorial;
- St. Elizabeths West Campus;
- Arlington National Cemetery, Tomb of the Unknown Soldier;
- Arlington House, The Robert E. Lee Memorial (Arlington House, The Robert E. Lee Memorial is located within the boundaries of Arlington National Cemetery, but is separately administered by the National Park Service); and
- The Pentagon.

Following consultation with review agencies (including the DC Historic Preservation Office [DC SHPO], NCPIC, and the Commission on Fine Arts [CFA] as part of the Section 106 process, this list was expanded to include these additional sites:

- The Old Post Office Tower; and

- The Netherlands Carillon (within Arlington Ridge Park).

Additional sites and areas surveyed, but eliminated from further consideration because the Long Bridge Corridor was not visible, included the following:

- Army-Navy Country Club (Arlington);
- United States Air Force Memorial (Arlington);
- I-395 (Arlington);
- Theodore Roosevelt Island (District);
- Key Bridge (District);
- Georgetown – Upper Wisconsin Avenue NW (District);
- National Cathedral grounds (District);
- Meridian Hill Park (District);
- Frederick Douglass House (District);
- South Capitol Street Bridge (District); and
- Banneker Park (District).

The representative views shown in **Figure 12-1** are described in **Table 12-1**. Given that the field surveys and photographic documentation were conducted during times of full to partial foliage, it is to be expected that the Long Bridge Corridor would be slightly more visible from certain vantage points if there were no leaves on the trees; however, the Study Area boundaries were drawn to account for potential seasonal variations in views and viewsheds.

When leaves are off the trees, a larger portion of the Long Bridge span over the Potomac River may be visible through the trees along the GWMP in some locations where existing views are present; however, the intermittent nature of views along the GWMP would remain due to the alignment of the roadway and topographic conditions. Moreover, views from East and West Potomac Parks would be slightly less obscured by the trees along the Potomac riverfront. A slightly larger portion of the Long Bridge Corridor is likely to be visible from the Lincoln Memorial and Netherlands Carillon given the intervening tree canopy in these distant views, but these differences would be difficult to discern from far away. Other views from higher elevations, across the Potomac, and in urban conditions would not be impacted by the absence of leaves on the trees. Additional consideration of potential visibility variations related to seasonal variations in foliage, and the implications for visual impacts, will be included in the Environmental Consequences analysis.

Table 12-1. In addition, the sequence of photographs provided in **Figure 12-2** to **Figure 12-34** provides representative examples of what can be seen of the Long Bridge Corridor from viewpoints throughout the Project Area.

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Table 12-1 | Descriptions of Representative Views

View	View Description
Potomac River Looking Northwest (View 1, Figure 12-2)	From the point of view of boats navigating the Potomac River, the Long Bridge span over the Potomac River is initially only faintly visible on the horizon. This view is characterized by sweeping, unobstructed views of open water.
Hains Point and Ohio Drive Looking Northwest (View 2, Figure 12-3)	From the vicinity of Hains Point along Ohio Drive, the Long Bridge Corridor is visible in the distance. From some vantage points, the bridge is partially obscured by trees lining the perimeter of East Potomac Park. This perspective is characterized by sweeping views of open water, with Long Bridge and adjacent bridges occupying the horizon.
East Potomac Park Looking Northwest (View 3, Figure 12-4)	As one progresses west along the southern edge of East Potomac Park, the bridge and its trestle become more clearly visible. This view is characterized by sweeping views of open water, with other Potomac River bridges visible beyond the Long Bridge Corridor.
Potomac River Looking Northwest (View 4, Figure 12-5)	As one approaches Long Bridge, the view is clear and unobstructed. This view is characterized by sweeping, unobstructed views of open water and the surrounding topographic bowl and Monumental Core.
Gravelly Point Looking North Along Mount Vernon Trail (View 5, Figure 12-6)	A portion of the Long Bridge span over the Potomac River, including its trestle, is clearly visible from the western half of Gravelly Point Park along the Mount Vernon Trail. A portion of the bridge and trestle is obscured by trees. This view is characterized by open fields, a stand of trees in the distance, and intermittent views of the river in between trees.
East Potomac Park Looking East (View 6, Figure 12-7)	As one progresses further west along the southern edge of East Potomac Park, the visual character is comprised of unobstructed, sweeping views of open water, with other Potomac bridges visible beyond the Long Bridge Corridor.
East Potomac Park at Long Bridge and Ohio Drive Looking Southwest (View 7, Figure 12-8)	From the western portion of East Potomac Park, the bridge and its trestle are clearly visible. It is also possible to see the deterioration and vandalism on the face of the Long Bridge structure, including rusting metal and graffiti. This view is characterized by unobstructed, sweeping views of open water, with the Crystal City skyline serving as a backdrop.
George Washington Memorial Parkway Looking Northeast (View 8, Figure 12-9)	The Long Bridge Corridor's span over the GWMP is clearly visible as motor vehicles approach the off-ramp to I-395; however, due to tree cover and the winding alignment of the Parkway, the Long Bridge Corridor is only briefly but significantly visible when the road curves just before the Long Bridge Corridor.
Long Bridge Park Looking Northeast (View 9, Figure 12-10)	The Long Bridge Corridor is clearly visible from the high point at the northern end of Long Bridge Park, partially obscured by the trees lining the railroad tracks. This view is characterized by the natural character of the shrubs, brush, and distant stand of trees that define the landscape to the north.

View	View Description
George Washington Memorial Parkway Looking North (View 10, Figure 12-11)	A portion of the Long Bridge span across the Potomac River is visible as motor vehicles approach the off-ramp to I-395; however, due to tree cover and the winding alignment of the Parkway, the bridge is only briefly but significantly visible when the road curves just before the off-ramp leading to I-395.
George Washington Memorial Parkway Looking Southeast (View 11, Figure 12-12)	The Long Bridge Corridor overpass is partially visible in the distance, beneath the Metrorail overpass, as motor vehicles approach the off-ramp leading to I-395. This view is characterized by the view of the GWMP and other transportation infrastructure passing above it.
I-395 Northbound Looking East and Southeast (Views 12 and 13, Figure 12-13 and Figure 12-14)	From I-395, along the eastern span of the 14 th Street Bridge, the Long Bridge span is partially visible above and below the Metrorail bridge. Due to the location of the Long Bridge Corridor to the east of I-395, this view is outside the comfortable field of view for most drivers, requiring a concerted effort to turn one's gaze to the east.
East Potomac Park Looking Southwest (View 14, Figure 12-15)	From the western portion of East Potomac Park, the northern portion of the Long Bridge span is visible underneath the Metrorail bridge, while the Long Bridge trestle is obscured by the elevated Metrorail tracks. This view is characterized by views of the water framed by Long Bridge, the Metrorail bridge, and the 14 th Street Bridge, with small portions of the Northern Virginia landscape visible in between bridges.
I-395 Northbound Looking East (View 15, Figure 12-16)	The span of the Long Bridge Corridor over I-395 is clearly visible to motorists traveling in both directions. Since the structure is in the primary field of view, it is possible for drivers and passengers to discern the rusting and deteriorating face of the bridge as well as the graffiti painted on it. This view is characterized by the auto-oriented highway landscape within the field of view and the stands of trees that line the Long Bridge Corridor in this location.
East Potomac Park Looking Northwest (View 16, Figure 12-17)	From the western edge of East Potomac Park, the Long Bridge Corridor is clearly visible to pedestrians and motorists as it passes over Ohio Drive SW. A portion of the landscape surrounding the Tidal Basin is visible in the distance underneath the bridge.
DC Marina Looking Northwest Along Maine Avenue SW (View 17, Figure 12-18)	The span of the Long Bridge Corridor over Maine Avenue SW first becomes visible in the distance from DC Marina, just west of the DC Fish Market. The view is industrial in character, defined by the parking lots, a portion of the two-story, brick Washington Marina Company structure; the elevated span of the 12 th Street Expressway; and the Maine Avenue SW embankment.
Maryland Avenue SW Looking Southwest (View 18, Figure 12-19)	The railroad tracks of the Long Bridge Corridor are clearly visible from the Portals development at the terminus of Maryland Avenue SW. This view looking down on the Long Bridge Corridor is only possible when standing and looking downward from the wall at the westernmost edge of the circle. The dome of the Jefferson Memorial is visible to the northwest.
West Potomac Park Looking South (View 19, Figure 12-20)	From West Potomac Park, the Long Bridge span over the Potomac River is largely obscured by the 14 th Street Bridge. Portions of the

View	View Description
	Long Bridge structure are faintly visible beneath and slightly above the 14 th Street Bridge. The view is characterized by open and unobstructed views of the water, with the 14 th Street Bridge dominating the horizon.
Potomac River Looking Southeast (View 20, Figure 12-21)	From the point of view of boats navigating the Potomac River, the Long Bridge span over the Potomac River is partially visible beyond both spans of the 14 th Street Bridge. The extent to which the Long Bridge structure is visible depends on the location in the river, but it is always obscured to a large extent by the 14 th Street Bridge; however, more of the bridge becomes visible from the water level as boats approach the 14 th Street Bridge.
West Potomac Park Looking South (View 21, Figure 12-22)	From West Potomac Park, the Long Bridge span over the Potomac River is largely obscured by the 14 th Street Bridge. Portions of the Long Bridge structure are faintly visible in the distance beneath the 14 th Street Bridge, while a small upper portion of the Long Bridge trestle is visible above. This view is characterized by open and unobstructed views of the water, with the 14 th Street Bridge dominating the horizon.
Arlington Memorial Bridge Looking Southeast (View 22, Figure 12-23)	From the top of the Arlington Memorial Bridge overlooking the Potomac River, much of the Long Bridge span is obscured by the 14 th Street Bridge; however, a portion of the Long Bridge trestle is visible in the distance. This view is characterized by sweeping views of the Potomac River, parkland along the GWMP and, in the distance, portions of the ridgelines forming the topographic bowl.
Potomac River Looking Southeast (View 23, Figure 12-24)	From the point of view of boats navigating the Potomac River north of the Arlington Memorial Bridge, the lower portion of the Long Bridge structure is visible in the distance underneath the Arlington Memorial Bridge. This view is characterized by open and unobstructed views of the water, with the Arlington Memorial Bridge dominating the horizon.
Washington Channel Looking Northwest (View 24, Figure 12-25)	From the point of view of boats entering the Washington Channel, the Long Bridge Corridor is clearly visible in the distance as it passes over the western end of the Channel. This view is characterized by open water views framed by the District Wharf and adjacent development to the south. The Washington Monument is clearly visible as a dominant feature in the horizon.
Lady Bird Johnson Park within the vicinity of Lyndon Baines Johnson Memorial Grove Looking Southeast (View 25, Figure 12-26)	From this viewpoint along the southern edge of the Potomac River, portions of the Long Bridge span are visible beyond the 14 th Street Bridge, which obscures large portions of the Long Bridge structure. This view is characterized by open water views with the 14 th Street Bridge and Long Bridge dominating the horizon.
Arlington House, The Robert E. Lee Memorial Looking Southeast (View 26, Figure 12-27)	The trestle of the Long Bridge structure is visible in the distance from higher elevation of Arlington House, The Robert E. Lee Memorial. This view is characterized by the panoramic view of the topographic bowl, with the Anacostia ridgeline serving as a backdrop.

View	View Description
Tomb of the Unknown Soldier Looking East (View 27, Figure 12-28)	The trestle of the Long Bridge structure is visible in the distance from this higher elevation of Arlington National Cemetery. This view is characterized the panoramic view of the topographic bowl, with the Anacostia ridgeline serving as a backdrop.
Kennedy Center Upper Terrace Looking South (View 28, Figure 12-29)	The trestle of the Long Bridge structure is visible in the distance from upper terrace of the Kennedy Center. This view is characterized by the panoramic view of the topographic bowl, with Lincoln Memorial dominating the foreground. The Potomac River is partially visible, while the Arlington ridgeline serves as a backdrop.
Lincoln Memorial Looking South (View 29, Figure 12-30)	From the viewing platform of the Lincoln Memorial, a portion of the trestle of the Long Bridge structure is visible just above the tree line. A portion of the Lincoln Memorial grounds is visible in the foreground.
Maryland Avenue SW Looking Northeast (View 30, Figure 12-31)	The Long Bridge Corridor is clearly visible alongside Maryland Avenue SW as it emerges from its underground portion beneath the Portals development. This view is characterized by transportation infrastructure, including Maryland Avenue and the walls lining the Long Bridge Corridor in this location. A portion of L'Enfant plaza development is visible to the east.
St. Elizabeths West Campus Looking Northwest (View 31, Figure 12-32)	The trestle of the Long Bridge structure is visible in the distance from the higher elevation of the St. Elizabeths West Campus. This view is characterized by the panoramic view of the topographic bowl. Portions of the Washington Channel and Potomac River are visible, while the Arlington ridgeline and Rosslyn skyline serve as backdrops.
The Netherlands Carillon, View from Top Looking Southeast (View 32, Figure 12-33)	The Long Bridge structure is visible in the distance as it crosses the Potomac River. This view is characterized by panoramic views the Potomac River, with Arlington National Cemetery in the foreground and the GWMP in the middleground.
Washington Monument Observation Deck (View 33)	Although the Washington Monument was inaccessible for field surveys due to ongoing renovations, it is assumed that the Long Bridge structure is visible in the distance, based on a review of photographs available online. This view is characterized by dramatic, panoramic, and unobstructed views of the surrounding area.
Old Post Office, View from Tower Looking South (View 34, Figure 12-34)	The Long Bridge structure, including its trestle, is partially and faintly visible in the distance. This view is characterized by panoramic views of the National Mall, Jefferson Memorial, Potomac River, and Arlington ridgeline.
The Pentagon, View from River Terrace (View 35)	The upper portion of the Long Bridge structure's trestle is visible in the distance, just above the tree line when viewed from the Pentagon's River Terrace. This view is characterized by views of the Boundary Channel and Pentagon Lagoon Yacht Basin, with Jefferson Davis Highway and Boundary Channel Drive visible in the foreground. Photographs are not permitted from this location.

12.5.10. Nighttime Conditions

Based on qualitative analysis and nighttime site visits, the majority of the Project Area and southern portion of the Study Area are largely characterized by a limited number of light sources and overall low ambient light levels in the immediate vicinity of the Long Bridge Corridor, as it crosses the Potomac River and then continues north and south across East Potomac Park and the GWMP, respectively. In these areas, the Long Bridge Corridor is mostly unlit. There is no lighting on the existing Long Bridge except for a series of small red lights denoting, for navigational purposes, the underside of the bridge where it spans the Potomac River.

Other permanent outdoor light sources in the vicinity of the Long Bridge Corridor include, most significantly, the street lighting on both spans of the 14th Street Bridge and the multicolored artistic light installation within the Bridge Tender's House on the 14th Street Bridge. Less significantly, other light sources include street lighting along the GWMP (particularly between Ronald Reagan Washington National Airport and I-395, with more modest street lighting north of I-395) and modest, pedestrian-oriented street lighting within East Potomac Park. At the southern end of the Study Area, the most significant, if intermittent, source of light is the athletic field lighting used for nighttime events at Long Bridge Park. The eastern side of the Long Bridge Corridor, adjacent to the Roaches Run Waterfowl Sanctuary, is largely unlit.

Numerous light sources in the surrounding area, outside the Study Area, provide ambient light. Most significantly, the runway and terminals of Ronald Reagan Washington National Airport provide significant amounts of light that spill over into Gravelly Point Park and the Mount Vernon Trail. Other significant sources of light include the distant skylines of L'Enfant Plaza, the Southwest waterfront (notably from the District Wharf development, which illuminates the Washington Channel, and the decorative blue lighting along the Francis Case Memorial Bridge), and Crystal City. The illuminated dome of the Jefferson Memorial and the Washington Monument also contribute significant amounts of light to the Study Area. The illuminated skylines of Rosslyn and Georgetown are visible, less prominently, in the distance.

Intermittent sources of light in the Study Area include the headlights of cars on GWMP and I-395, airplanes landing and taking off from Ronald Reagan Washington National Airport, illuminated Metrorail trains crossing the GWMP and the river, and the lights of bicyclists on the Mount Vernon Trail (particularly during the evening rush hour in cold-weather months, when the sun sets early and bare trees make the trail more visible to drivers and other passersby).

Figure 12-35 through **Figure 12-39** illustrate representative nighttime conditions and light sources near the Long Bridge Corridor.

Additional Figures: Photographs of Representative Views

Figure 12-2 | View 1: Potomac River Looking North



Figure 12-3 | View 2: Hains Point and Ohio Drive Looking North



Figure 12-4 | View 3: East Potomac Park Looking North



Figure 12-5 | View 4: Potomac River Looking North



Figure 12-6 | View 5: Gravelly Point Looking North along Mount Vernon Trail



Figure 12-7 | View 6: East Potomac Park at Ohio Drive Looking North



Figure 12-8 | View 7: East Potomac Park at Long Bridge and Ohio Drive Looking Southwest



Figure 12-9 | View 8: George Washington Memorial Parkway Looking North to Long Bridge Corridor



Figure 12-10 | View 9: Long Bridge Park Looking North to Long Bridge Corridor



Figure 12-11 | View 10: George Washington Memorial Parkway Looking North



Figure 12-12 | View 11: George Washington Memorial Parkway Looking South



Figure 12-13 | View 12: I-395 Northbound Looking Southeast



Figure 12-14 | View 13: I-395 Northbound Looking South



Figure 12-15 | View 14: East Potomac Park Looking Southwest



Figure 12-16 | View 15: I-395 Northbound Looking East to Long Bridge Corridor



Figure 12-17 | View 16: East Potomac Park Looking North to Long Bridge Corridor



Figure 12-18 | View 17: DC Marina Looking North along Maine Avenue SW to Long Bridge Corridor



Figure 12-19 | View 18: Maryland Avenue SW Looking Southwest to Long Bridge Corridor



Figure 12-20 | View 19: West Potomac Park Looking South



Figure 12-21 | View 20: Potomac River Looking South



Figure 12-22 | View 21: West Potomac Park Looking South



Figure 12-23 | View 22: Arlington Memorial Bridge Looking South



Figure 12-24 | View 23: Potomac River Looking South



Figure 12-25 | View 24: Washington Channel Looking North to Long Bridge Corridor

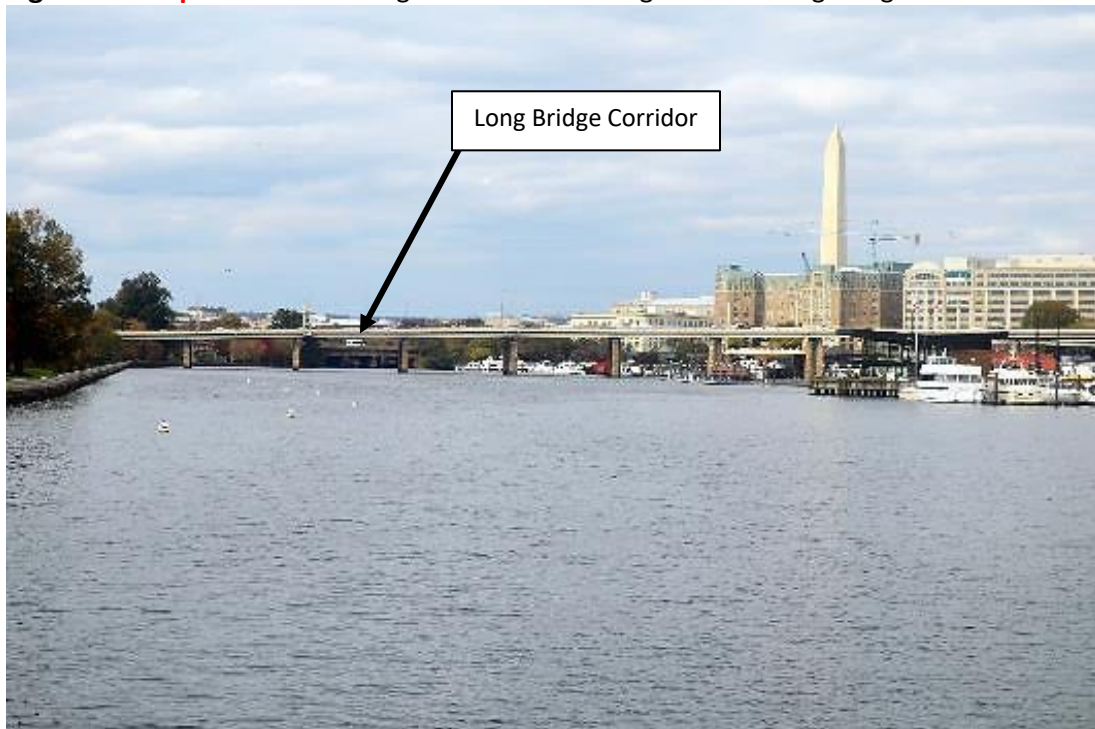


Figure 12-26 | View 25: Lady Bird Johnson Park within the vicinity of Lyndon Baines Johnson Memorial Grove Looking Southeast



Figure 12-27 | View 26: Arlington House, The Robert E. Lee Memorial Looking Southeast

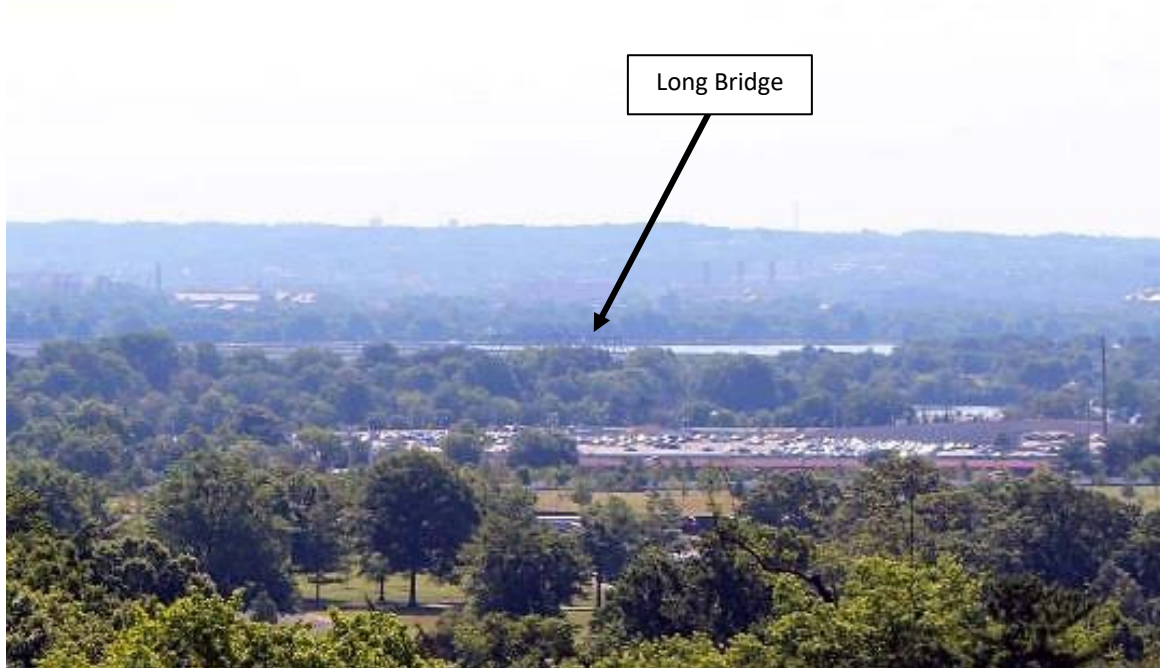


Figure 12-28 | View 27: Tomb of the Unknown Soldier Looking Southeast



Figure 12-29 | View 28: Kennedy Center Upper Terrace Looking South

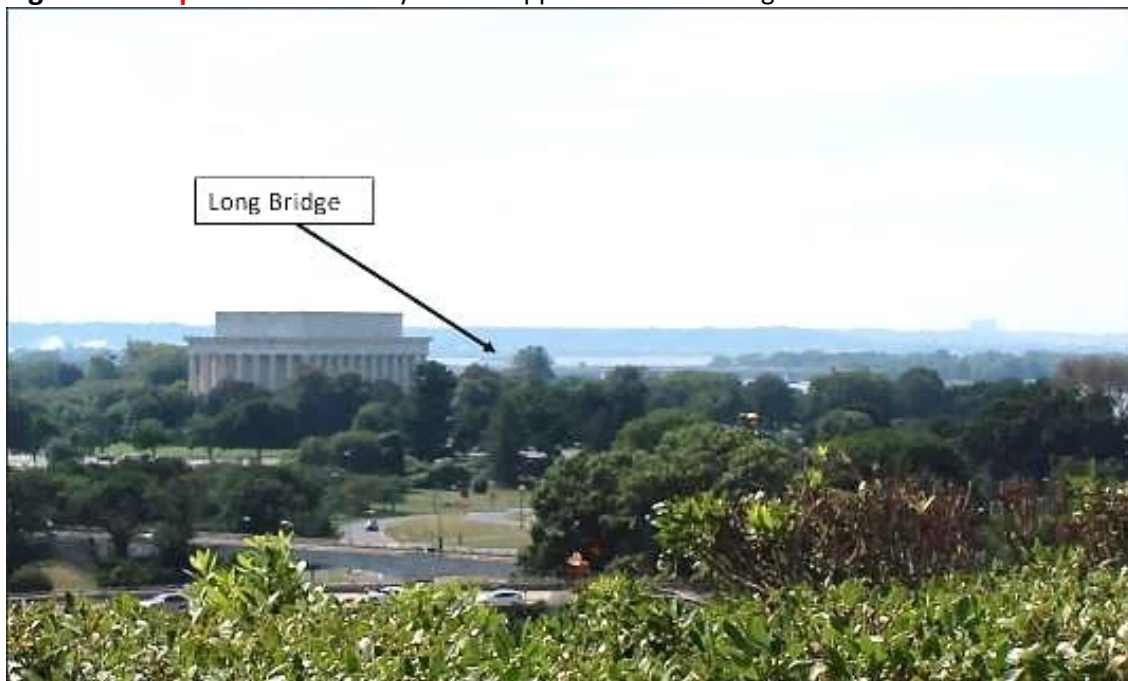


Figure 12-30 | View 29: Lincoln Memorial Looking South



Figure 12-31 | View 30: Maryland Avenue SW Looking Northeast to Long Bridge Corridor



Figure 12-32 | View 31: St. Elizabeths West Campus Looking Northwest

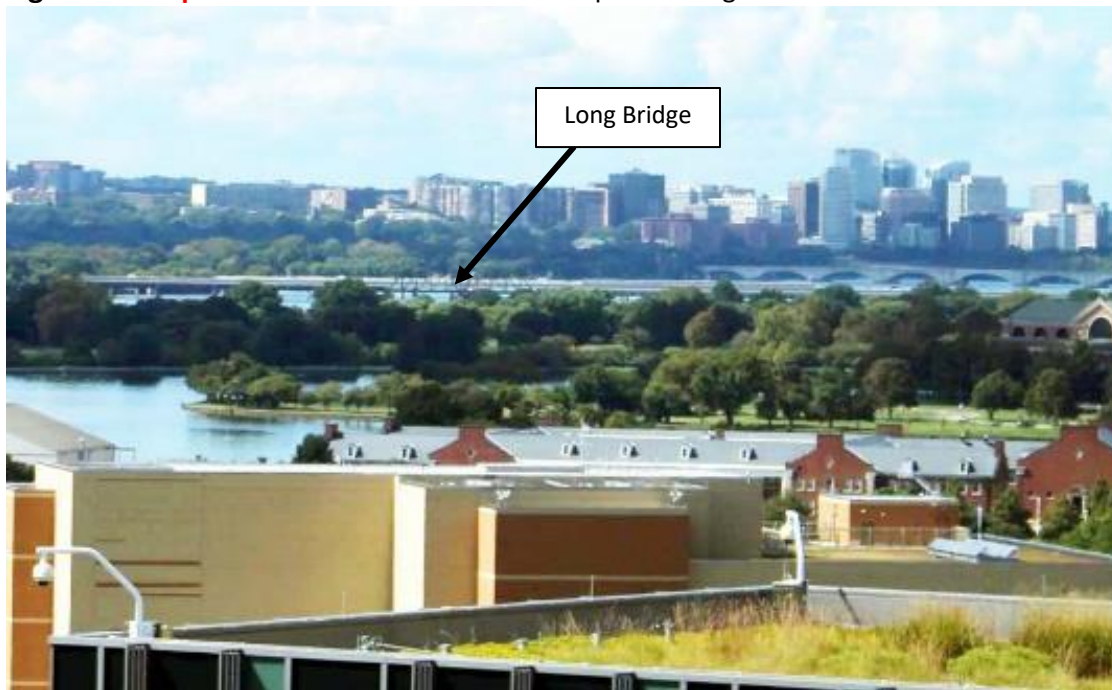


Figure 12-33 | View 32: The Netherlands Carillon, View from Top Looking Southeast

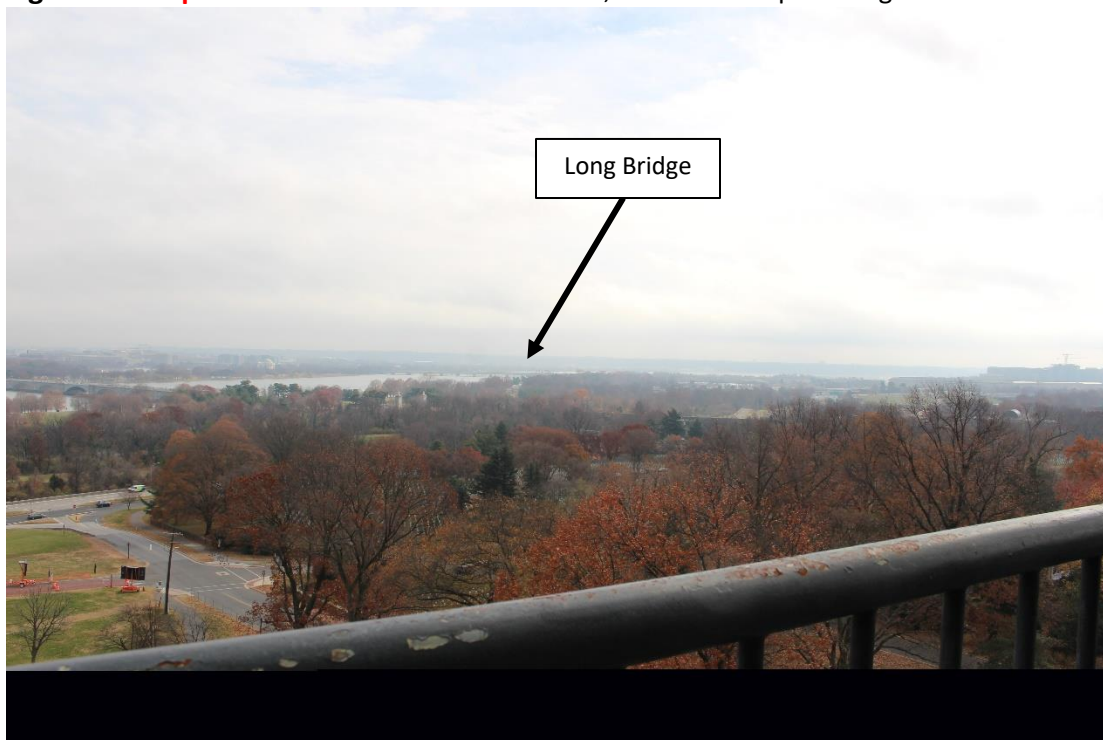
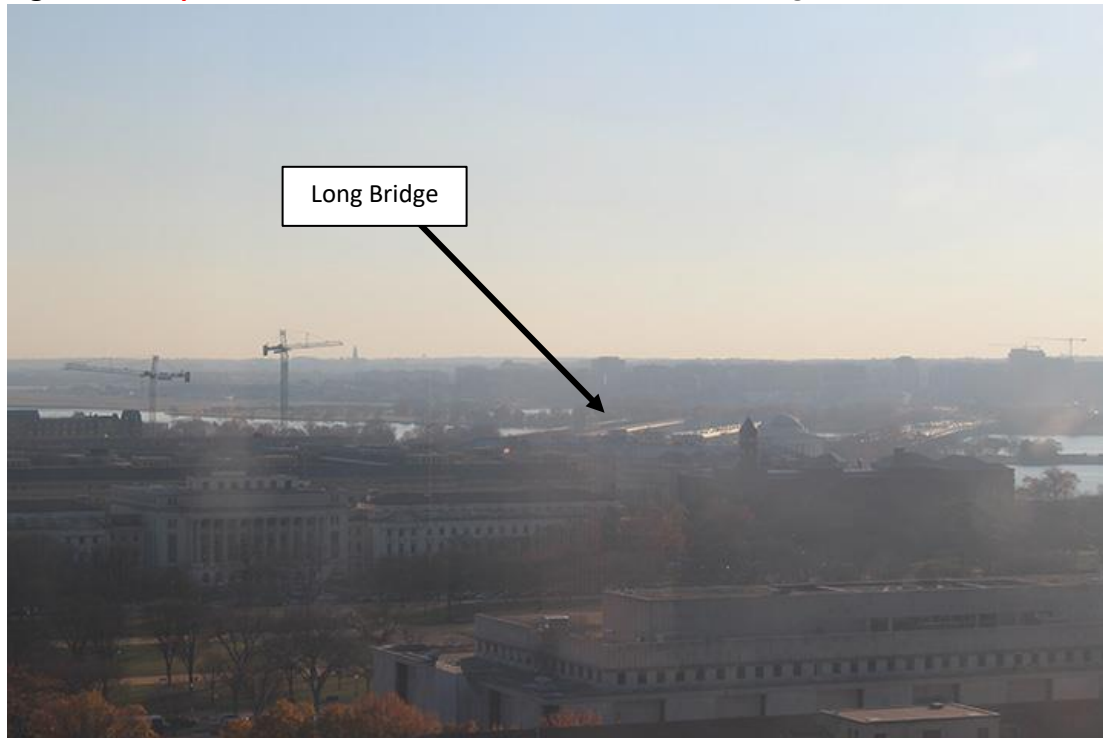


Figure 12-34 | View 34: Old Post Office, View from Tower Looking South



Additional Figures: Photographs of Nighttime Conditions

Figure 12-35 | Nighttime Conditions, as seen from East Potomac Park



Figure 12-36 | Nighttime Conditions, Gravelly Point Park



Figure 12-37 | Nighttime Conditions, 14th Street Bridge

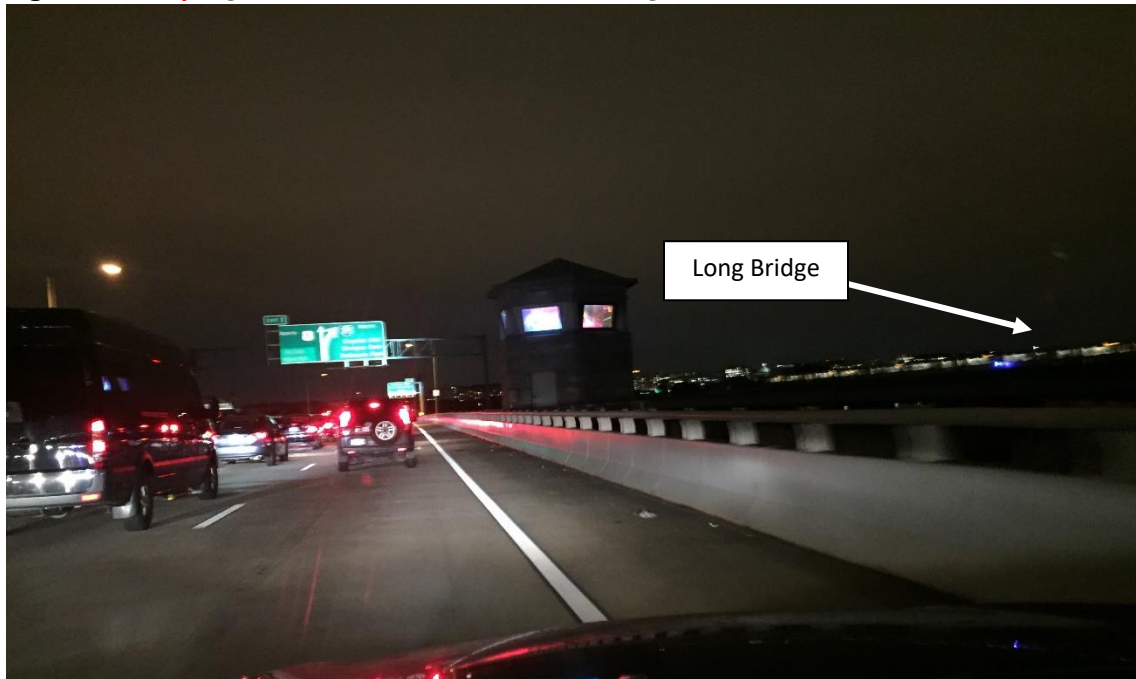
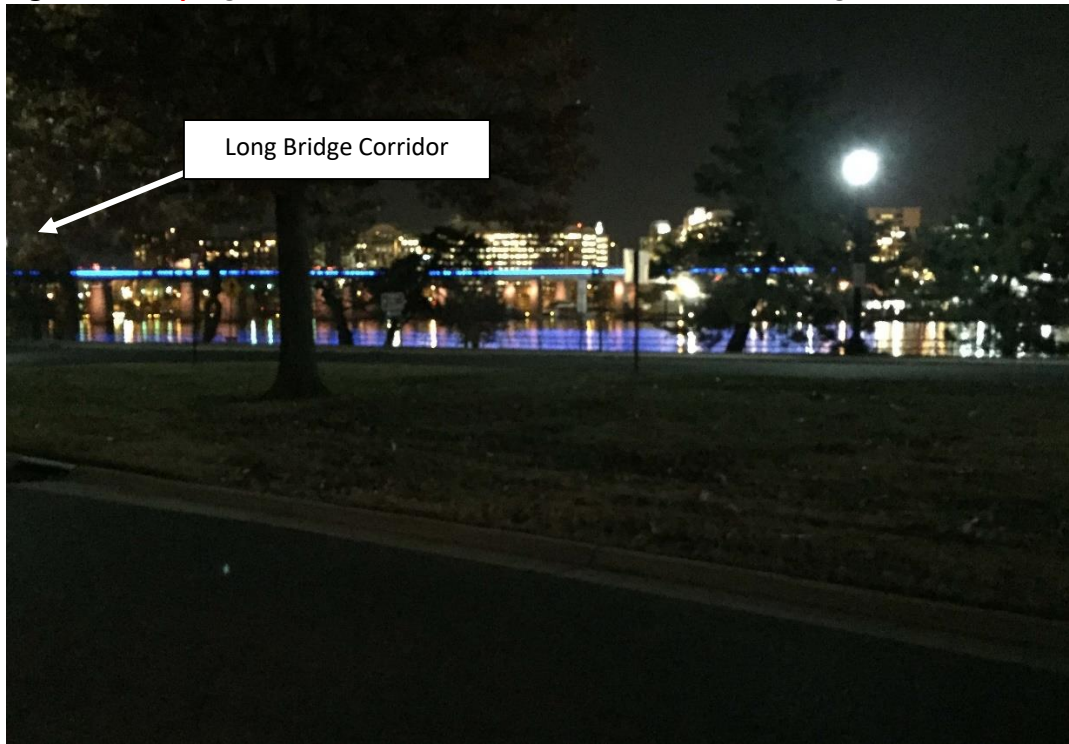


Figure 12-38 | Nighttime Conditions, George Washington Memorial Parkway



Figure 12-39 | Nighttime Conditions, East Potomac Park and Washington Channel



13.0 Cultural Resources

13.1. Overview

This section documents cultural resources within the Area of Potential Effects (APE) for the Long Bridge Project. The term “cultural resources” includes all resources included within the definition of “historic properties” as defined by the implementing regulations of Section 106 of the National Historic Preservation Act (NHPA). According to the Section 106 implementing regulations, historic properties are defined as “...any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP) maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria.”⁴¹⁸ The definition of historic properties also includes National Historic Landmarks (NHLs), which are nationally significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting U.S. heritage. Properties designated as NHLs are listed in the NRHP upon designation as NHLs.

The definition of cultural resources additionally includes such resources as sacred sites, cultural landscapes, traditional cultural properties (TCPs), archaeological sites not eligible for listing in the NRHP, and archaeological collections. Cultural resources also include significant local and state monuments, properties listed in local and state historic registers, and other sites of cultural significance that are not otherwise eligible for NRHP listing. Additional regulations and the regulatory agencies associated with sites of cultural and historical significance are outlined in the following sections.

13.2. Regulatory Context and Guidance

The following laws, regulations, agency jurisdictions, and guidance are pertinent to cultural resources. Key regulations and guidance that are most relevant to the Long Bridge Project are listed below.

13.2.1. Cultural Resources Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- NHPA of 1966⁴¹⁹
- Advisory Council on Historic Preservation, Protection of Historic Properties, 2004⁴²⁰
- Archaeological and Historic Preservation Act of 1960⁴²¹

⁴¹⁸ 36 CFR 800.16(d)

⁴¹⁹ 16 USC 470

⁴²⁰ 36 CFR 800

⁴²¹ 16 USC 469

- Archaeological Resources Protection Act of 1979⁴²²
- Native American Graves Protection and Repatriation Act of 1990⁴²³
- American Indian Religious Freedom Act of 1978⁴²⁴
- American Antiquities Act of 1906⁴²⁵

Relevant Federal Guidance:

- Council on Environmental Quality, Executive Office of the President, and Advisory Council on Historic Preservation, National Environmental Policy Act (NEPA) and NHPA: A Handbook for Integrating NEPA and Section 106, March 2013⁴²⁶
- The Secretary of the Interior's Standards for Treatment of Historic Properties⁴²⁷

13.2.2. Cultural Resources State and Local Laws, Regulations, and Other Guidance

Relevant State and Local Laws and Regulations:

- Virginia Antiquities Act of 1991⁴²⁸
- District of Columbia Historic Landmark and Historic District Protection Act of 1978⁴²⁹
- The Arlington County Historic Preservation Program is prescribed by Part 11.3 (Historic Preservation Overlay District) of the Arlington County Zoning Ordinance⁴³⁰

The District of Columbia Historic Preservation Office undertakes the role of a State Historic Preservation Officer (DC SHPO) for the District. Similarly, the Virginia Department of Historic Resources (VDHR) serves as the SHPO for the Commonwealth of Virginia.

⁴²² 16 USC 470aa-mm

⁴²³ 31 USC 3001

⁴²⁴ 42 USC 1996

⁴²⁵ 16 USC 431

⁴²⁶ Council on Environmental Quality, Executive Office of the President, and Advisory Council on Historic Preservation. Undated. NEPA and NHPA: A Handbook for Integrating NEPA and Section 106. Accessed from http://www.achp.gov/docs/NEPA_NHPA_Section_106_Handbook_Mar2013.pdf. Accessed January 9, 2017.

⁴²⁷ National Park Service (NPS), Technical Preservation Services. Undated. The Secretary of the Interior's Standards for Treatment of Historic Properties. Accessed from <https://www.nps.gov/tps/standards.htm>. Accessed January 9, 2017.

⁴²⁸ Code of Virginia Chapter 23

⁴²⁹ DC Code 6-1101

⁴³⁰ Arlington County Zoning Ordinance. Undated. Arlington County Historic Preservation Program: Part 11.3. Accessed from https://arlingtonva.s3.dualstack.us-east-1.amazonaws.com/wp-content/uploads/sites/31/2014/04/ACZO_11.3_HistoricPres.pdf. Accessed May 1, 2018.

Relevant State and Local Guidance:

- VDHR, Guidelines for Conducting Historic Resources Survey in Virginia, September 2017⁴³¹
- DC Preservation League et al., Guidelines for Archaeological Investigations in the District of Columbia, April 1998⁴³²

13.3. Study Area

The study area for the identification of historic and cultural resources is consistent with the APE for NHPA Section 106 compliance. Section 106 implementing regulations define the APE as “...the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any 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.”⁴³³ The APE is defined to allow for the evaluation of potential effects to historic properties resulting from an undertaking. According to the steps prescribed by the Section 106 regulations, the APE must be defined before the identification of historic properties and evaluation of potential effects occurs. For the Long Bridge, the APE represents the Local Study Area. Because the Project has no potential to adversely affect historic properties beyond the APE, it was not necessary to define a Regional Study Area.

For each undertaking, the Section 106 regulations require the Lead Federal Agency to determine an APE boundary that considers multiple types of effects on historic properties, rather than multiple APEs that address various effects. Non-contiguous APEs may be developed, however, to include multiple alternative project areas or multiple areas where possible effects may be reasonably anticipated. The regulations also require the Lead Federal Agency seek information from consulting parties and others likely to have knowledge of, or concerns with, historic properties in the area, to identify issues relating to the undertaking's potential effects on historic properties.

The VDHR provides guidance on APE development, requiring the APE to include all locations where the project will cause ground disturbance, all locations from which the project may be visible or audible, and all locations where the project may result in changes to land use, public access, traffic patterns, etc. (DC SHPO does not offer comparable guidance).⁴³⁴

The APE for the Long Bridge Project was delineated to identify and document the areas from which the Project will result in ground disturbance or will be reasonably visible or audible. The APE was developed during the Concept Screening process, before the Action Alternatives for the Project had been determined. Therefore, assumptions for the Project Area and scope were identified based on the results

⁴³¹ Virginia Department of Historic Resources (VDHR). September 2017. Guidelines for Conducting Historic Resources Survey in Virginia. Accessed from http://dhr.virginia.gov/pdf_files/SurveyManual_2017.pdf. Accessed June 4, 2018.

⁴³² DC Preservation League et al. April 1998. Guidelines for Archaeological Investigations in the District of Columbia. Accessed from <https://planning.dc.gov/sites/default/files/dc/sites/op/publication/attachments/DCArchaeologyGuidelines1998.pdf>. Accessed June 4, 2018.

⁴³³ 36 CFR 800.16(d)

⁴³⁴ VDHR. Undated. Defining Your Area of Potential Effects. Accessed from http://www.dhr.virginia.gov/pdf_files/Defining_Your_APE.pdf. Accessed June 4, 2018.

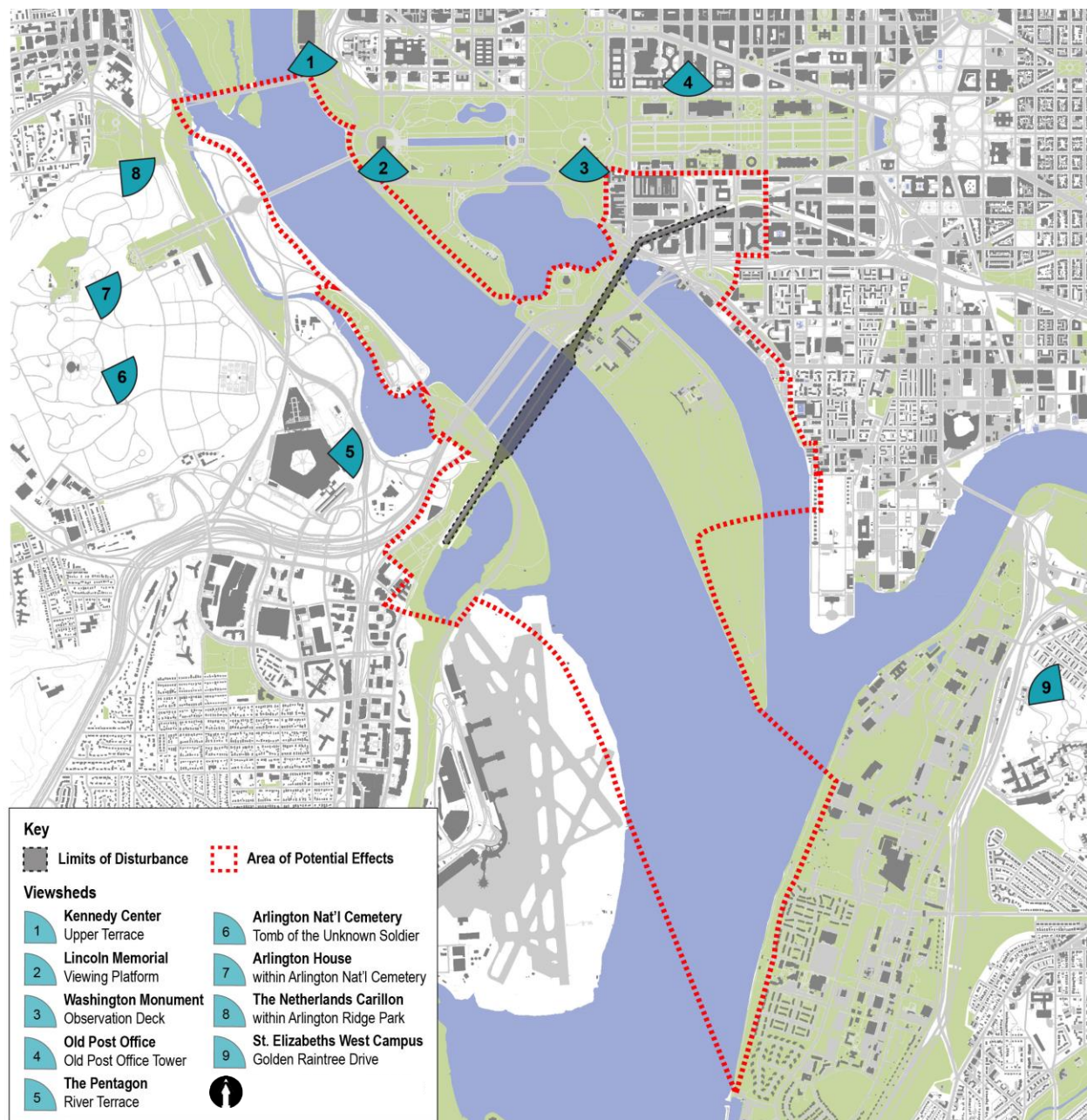
of Level 1 Concept Screening, which assessed preliminary concepts by their ability to meet the Project's Purpose and Need based on railroad capacity, transportation network connectivity, and railroad resiliency and redundancy. The Level 1 Concept Screening determined that three, four, or five (or more) tracks could meet Purpose and Need, either with or without a bike-pedestrian crossing. Only above-ground crossings (bridges) were found to meet Purpose and Need because a freight tunnel could not feasibly connect to existing freight infrastructure, and a passenger-only tunnel would not improve redundancy.

The opportunity is currently being explored to provide a bike-pedestrian connection on a new railroad bridge, or on a separated structure upstream or downstream of a railroad bridge. Upstream bike-pedestrian alignments would be constrained by the Metrorail bridge, while downstream alignments would need to avoid a Department of Defense Facility in East Potomac Park, and would therefore land close to the NPS headquarters building. Therefore, the outer limits of the potential Limits of Disturbance (LOD) were set by the bike-pedestrian crossing alignment options.

As shown in **Figure 13-1**, the APE and LOD boundaries were mapped two dimensionally, although it was assumed that the boundaries encompass both above-ground and below-ground resources, including potential underwater and archaeological resources.

The LOD is defined as the geographic area within which ground disturbance is anticipated to occur for the Project. It is developed to better understand the potential effects to archaeological resources within the APE. Along the span of the existing Long Bridge and on National Park Service (NPS) land on either side of the Potomac River, the LOD includes potential realignments of the existing railroad bridge in addition to bike and pedestrian bridge crossing options. These potential bridge realignments extend from the existing Metrorail Bridge to approximately 500 feet to the southeast. The LOD extends outward from these points on the east and west banks of the Potomac at a distance of approximately 250 to 300 feet, to incorporate associated bike and pedestrian access ramps on each side. Along the remainder of the Project Area, the LOD includes a buffer of approximately 50 feet on either side of the existing corridor centerline.

Figure 13-1 | Study Area for Cultural Resources



Field survey photographs led to the identification of viewshed sites outside of the contiguous APE boundary. The field survey and photographs were used to determine visibility of the Long Bridge from specific vantage points. The selection of the viewshed sites was informed by whether the Project Area was clearly visible from a specific exterior vantage point or publicly accessible plaza or viewing platform. However, the view was sufficiently limited in these locations to not warrant expanding the APE to encompass the entirety of each site (for example, the Long Bridge was visible from Arlington House and the Tomb of the Unknown Soldier, but not from the entirety of Arlington National Cemetery). Interiors of buildings were excluded from consideration. All viewshed sites are also historic properties, so there

may be potential for impacts to these properties from the implementation of the Long Bridge Project. The viewsheds identified include:

- The Kennedy Center;
- The Washington Monument;
- The Lincoln Memorial;
- St. Elizabeths West Campus;
- The Old Post Office Tower;
- Arlington National Cemetery, Tomb of the Unknown Soldier;
- Arlington House, The Robert E. Lee Memorial (Arlington House, The Robert E. Lee Memorial is located within the boundaries of Arlington National Cemetery, but is separately administered by the National Park Service);
- The Netherlands Carillon (within Arlington Ridge Park); and
- The Pentagon.

13.4. Methodology

Cultural resources within the APE were identified using the following information sources:

- Geographic Information System (GIS) mapping data provided by the District and Arlington County
- DC Inventory of Historic Sites⁴³⁵
- NRHP database⁴³⁶
- General Services Administration (GSA) Historic Buildings website⁴³⁷
- Virginia Landmarks Register (VLR)⁴³⁸
- Virginia Cultural Resource Information System (V-CRIS)⁴³⁹
- Properties that are pending or have been recently listed in the NRHP
- NPS Cultural Landscape Inventory

⁴³⁵ DC Historic Preservation Office. Undated. DC Inventory of Historic Sites. Accessed from <https://planning.dc.gov/page/dc-inventory-historic-sites>. Accessed January 10, 2018.

⁴³⁶ NPS. Undated. NRHP Database. Accessed from <https://npgallery.nps.gov/nrhp>. Accessed January 10, 2018.

⁴³⁷ U.S. General Services Administration. Undated. GSA Historic Buildings Website. Accessed from <https://www.gsa.gov/real-estate/historic-preservation/explore-historic-buildings>. Accessed January 10, 2018.

⁴³⁸ VDHR. Undated. Virginia Landmarks Register of Historic Places. Accessed from http://www.dhr.virginia.gov/registers/register_counties_cities.htm. Accessed January 10, 2018.

⁴³⁹ Virginia Cultural Resources Information System. Accessed from <https://vcris.dhr.virginia.gov/vcris/Account/Login?ReturnUrl=%2fvcris%2f>. Accessed January 10, 2018.

- Properties that have been formally determined eligible for NRHP listing by a Federal agency and confirmed by the Keeper of the NRHP
- Properties at or greater than 45 years of age that have not been previously evaluated for NRHP eligibility
- Contributing streets and avenues, views and vistas, reservations, and other contributing components listed in the Plan of the City of Washington (L'Enfant Plan; L'Enfant-McMillan Plan)
- NRHP documentation

In the future, the identification effort will be expanded to include:

- Potential archaeological resources within the LOD. A Phase IA archaeological assessment is being conducted to identify known and potential archaeological resources in the LOD.⁴⁴⁰
- Any additional feedback from DC SHPO, VDHR, and other Consulting Parties.

Properties located within the APE that are at least 45 years of age were evaluated against the NRHP Criteria for Evaluation.⁴⁴¹ An assessment of integrity for each property was also undertaken. This age was selected to account for the 50-year threshold that is generally observed in the evaluation of historic significance, and to account for the implementation schedule of the Long Bridge Project (which may extend 5 or more years into the future). These properties were identified using a range of documentation resources, including real property and building permit data, historic maps and photographs, and aerial photographs. A preliminary evaluation of each property's potential historic significance and integrity is provided herein as a resource for potential future detailed evaluation by the Federal Railroad Administration (FRA) or others (such as the project sponsor) at the time of project implementation.

⁴⁴⁰ The Phase 1A is a desktop study that uses archaeological and historical background research, elevation change analysis, and GIS mapping technology to assess the probability for the presence of historic and prehistoric period archaeological resources to exist within the LOD.

⁴⁴¹ NPS. Undated. National Register of Historic Places, Frequently Asked Questions. Accessed from <http://www.nationalregisterofhistoricplaces.com/faq.html>. Accessed May 3, 2018.

13.5. Affected Environment

13.5.1. Archaeological Resources

A Phase IA Archaeological Assessment conducted for the Project (see **Long Bridge Project DEIS Appendix G4, Phase IA Archaeological Assessment Technical Report**) identified the following three terrestrial areas of high potential for archaeological resources within the Long Bridge Project limits of disturbance (LOD):

- The eastern half of the area from the GWMP south to RO Interlocking, which has a high potential for prehistoric Native American archaeological features and artifact deposits;
- Areas east and west of the existing railroad Corridor at GWMP, which are the location of Jackson City (archaeological site 44AR0037); and,
- The area west of 12th Street SW, which has a high potential for prehistoric Native American and Historic period artifact and feature deposits.

The archaeological assessment also identified one submerged area of moderate potential: the area from the middle of the Potomac River to the shoreline of East Potomac Park, which has a moderate potential for piers associated with earlier bridges. This area was a terrestrial landform during the late Pleistocene/early Holocene epochs. While recent investigations at West Potomac Park concluded that river migration destroyed this landform, a PaleoIndian projectile point was reported to DC SHPO from this approximate area. As such, the area from the middle of the Potomac River to the western shoreline of East Potomac Park has a moderate potential for prehistoric Native American artifact and feature deposits. All other terrestrial or submerged areas within the LOD have low or no potential for archaeological resources. FRA has not evaluated these sites for NRHP eligibility or their value for preservation in place.⁴⁴²

Additional investigations will be identified in consultation with the appropriate SHPO, and will be conducted during Final Design. Because the U.S. Department of the Interior has jurisdiction over a majority of the area within the LOD (including the bottom lands of the Potomac River), FRA and DDOT will also coordinate with NPS regarding potential impacts to archaeological resources, including potential underwater archaeology.

13.5.2. Designated Historic Properties

The following properties have been listed in the NRHP, DC Inventory of Historic Sites (DC), the VLR, or have been documented as Cultural Landscapes (CL) by NPS. As shown in **Table 13-1**, two properties have been designated as NHLs. In some cases, these properties were determined eligible for NRHP listing (Determination of Eligibility [DOE]) and also designated as landmarks in the DC Inventory of Historic Sites.

⁴⁴² When FRA, in consultation with the DC SHPO and VDHR, determines that the archeological resource is important chiefly because of what can be learned by data recovery and has minimal value to preservation in place.

Table 13-1 | Designated Historic Properties

#	Name	Location	Designation
1.	National Mall Historic District	Washington, DC	DC, NRHP
2.	Parkways of the National Capital Region	Washington, DC	VLR, NRHP
3.	Rock Creek and Potomac Parkway Historic District	Along the Potomac River and Rock Creek from the Lincoln Memorial to the National Zoo	DC, NRHP
4.	George Washington Memorial Parkway	Arlington County (extends to City of Alexandria and Fairfax County)	VLR, NRHP
5.	Mount Vernon Memorial Highway	Arlington County (extends to City of Alexandria and Fairfax County)	VLR, NRHP, CL
6.	Plan of the City of Washington ¹	Washington Region Multi-Property Submission	DC, NRHP
7.	East and West Potomac Parks Historic District	Washington, DC	DC, NRHP
8.	Thomas Jefferson Memorial	East Basin Drive SW, Washington, DC	DC, NRHP
9.	Central Heating Plant	325 13 th Street SW, Washington, DC	DC, NRHP
10.	U.S. Department of Agriculture (USDA) Cotton Annex	300 12 th Street SW, Washington, DC	DC, NRHP
11.	HUD Building (Robert C. Weaver Federal Building)	451 7 th Street, SW, Washington, DC	DC, NRHP
12.	U.S. Department of Agriculture South Building	1352 C Street SW, Washington, DC	DC, NRHP
13.	Bureau of Engraving and Printing	301 14 th Street SW, Washington, DC	DC
14.	Auditor's Building Complex	14 th Street and Independence Avenue SW, Washington, DC	DC, NRHP
15.	Arlington Memorial Bridge (and related features)	Memorial Avenue, Washington, DC & Virginia	DC, NRHP, CL
16.	Fort Leslie J. McNair Historic District (The Old Arsenal) ²	4 th and P Streets SW, Washington, DC	DC
17.	Titanic Memorial	Water and P Streets SW, Washington, DC	DC, NRHP
18.	Lunch Room Building and Oyster Shucking Shed ¹	1100 Maine Avenue SW, Washington, DC	DC
19.	Cuban Friendship Urn	Reservation 332, Ohio Drive at 14 th Street Bridge SW, Washington, DC	DC, NRHP
20.	Theodore Roosevelt Island National Memorial (Analostan Island) ¹	Potomac River west of Georgetown Channel	DC, NRHP
21.	Lyndon Baines Johnson Memorial Grove ¹	Columbia Island in Lady Bird Johnson Park	DC, NRHP
22.	Lincoln Memorial (Statue of Lincoln) ¹	West Potomac Park, Washington, DC	DC, NRHP

#	Name	Location	Designation
23.	Washington Monument and Grounds Historic District ^{1,3}	14 th Street, between Constitution and Independence Avenues, Washington, DC	DC, NRHP
24.	Arlington House, The Robert E. Lee Memorial Historic District ³	Roughly bound by Sheridan Drive, Ord and Weitzel Drive, Humphrey's Drive, and Lee Avenue in Arlington National Cemetery	VLR, NRHP, CL
25.	Arlington National Cemetery Historic District ¹	One Memorial Avenue, Arlington, VA	NRHP
26.	St. Elizabeths Hospital Historic District ²	2700 Martin Luther King Jr. Avenue SE, Washington, DC	DC, NRHP, NHL
27.	Arlington Ridge Park (Netherlands Carillon) ³	Northwest corner of N Meade Street and Marshall Drive in Arlington, VA	VLR, NRHP, CL
28.	Old Post Office ³	1100 Pennsylvania Avenue NW, Washington, DC	DC, NRHP
29.	The Pentagon ³	US 1, Virginia Route 110, and I-395	VLR, NRHP, NHL

Notes: ¹ All or portions of these properties have also been identified and evaluated as cultural landscapes.

² These properties have also been determined eligible for listing in the NRHP.

³ These properties are designated as viewshed locations outside of the contiguous APE boundaries.

13.5.3. Eligible Historic Properties

Nine additional properties have been determined eligible by a Federal agency or recommended as eligible by a SHPO for listing in the NRHP (listed in **Table 13-2**) and are shown in **Figure 13-2**.

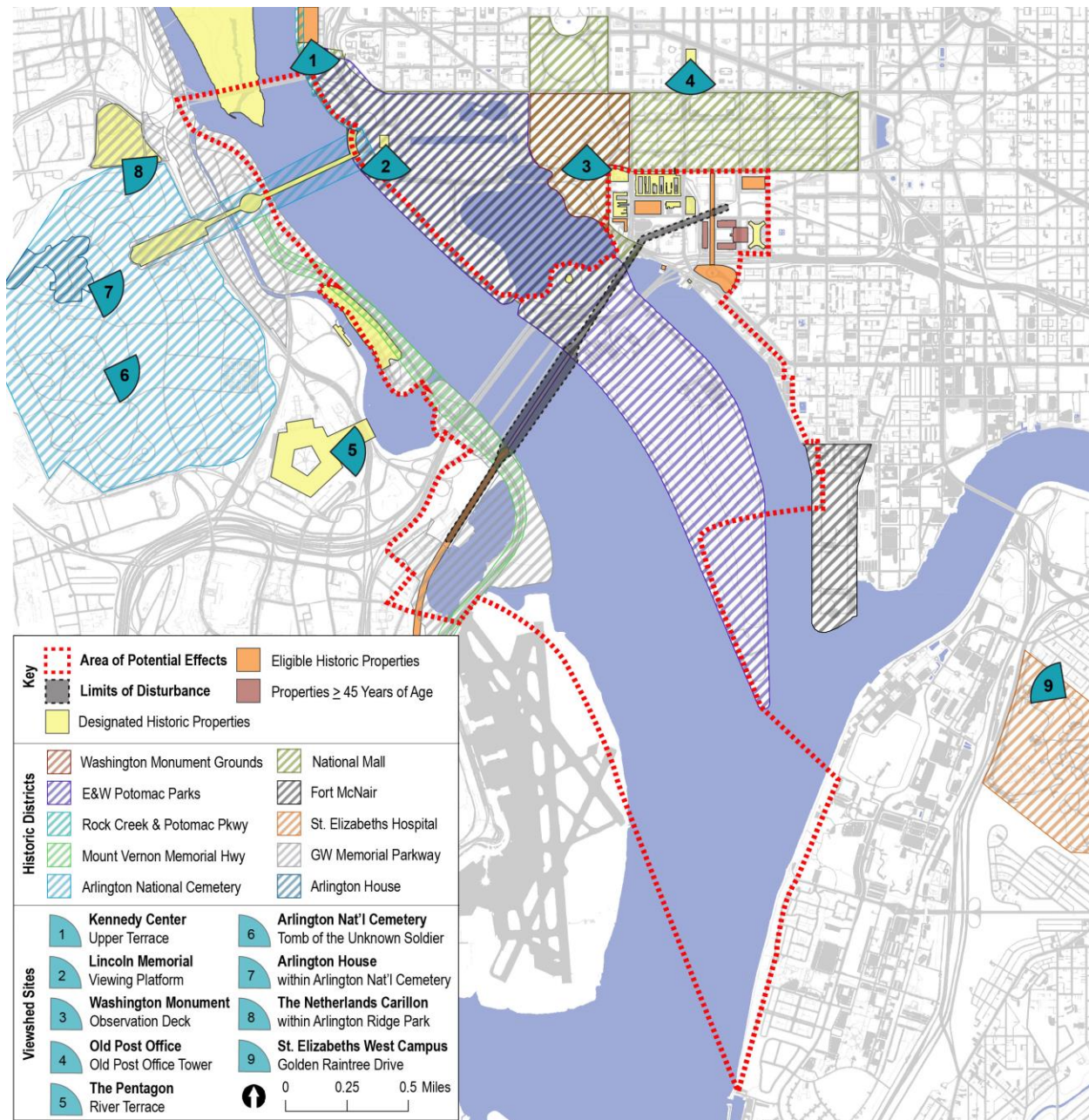
Table 13-2 | Eligible Historic Properties

#	Name	Location	Designation
1.	Bureau of Engraving and Printing Annex	300 14 th Street SW, Washington, DC	DOE
2.	Federal Office Building 10A (Orville Wright Building)	800 Independence Ave SW, Washington, DC	DOE
3.	Benjamin Banneker Park and Overlook; 10 th Street Overlook ¹	Terminus of 10 th Street SW, Washington, DC	DOE
4.	Richmond, Fredericksburg and Potomac Railroad Historic District	Along CSX right-of-way in Virginia from Arlington County to the City of Richmond	DOE
5.	Washington Marina Building	1300 Maine Avenue SW, Washington, DC	DOE
6.	L'Enfant Promenade	Section of 10 th Street SW between Independence Avenue and Banneker Park, Washington, DC	DOE
7.	Lady Bird Johnson Park ¹	George Washington Memorial Parkway	DOE
8.	John F. Kennedy Center for the Performing Arts ²	2700 F Street NW, Washington, DC	DOE
9.	Liberty Loan Federal Building	401 14 th Street SW, Washington, DC	DOE

Notes: ¹ All or portions of these properties have also been identified and evaluated as cultural landscapes.

² These properties are designated as viewshed locations outside of the contiguous APE boundaries.

Figure 13-2 | Map of APE with Designated and Eligible Historic Properties



13.5.4. Undesignated Properties (at or Greater than 45 Years of Age)

Table 13-3 lists properties within the APE that were constructed prior to 1972. Preliminary determinations by FRA have been made regarding each property's potential eligibility for listing in the NRHP.

Table 13-3 | Properties Constructed Prior to 1972

#	Name	Location	Date(s)	Preliminary Determination of Eligibility
1.	Astral Building (North Building, L'Enfant Plaza)	955 L'Enfant Plaza SW, Washington, DC	1968	Potentially eligible
2.	Comsat Building (South Building, L'Enfant Plaza)	950 L'Enfant Plaza SW, Washington, DC	1965	Potentially eligible
3.	Loew's L'Enfant Plaza Hotel (East Building, L'Enfant Plaza)	470-490 L'Enfant Plaza SW, Washington, DC	1971 to 1973	Potentially eligible
4.	United States Postal Service (USPS) Building (West Building, L'Enfant Plaza)	475 L'Enfant Plaza SW, Washington, DC	1969 to 1971	Potentially eligible

14.0 Parks and Recreation

14.1. Overview

This section describes the existing parks and recreation areas near the Long Bridge Project. The National Environmental Policy Act (NEPA) requires consideration of the potential effects of Federal actions on parks and recreation areas. This section describes the regulatory setting and the affected environment of parks and recreation areas. This evaluation of parks and recreation areas includes public parks, trails, paths, and areas open to the public and used for general recreation. Separate evaluations of parklands and related resources regulated under Section 4(f) of the U.S. Department of Transportation Act of 1966, as amended, and under Section 6(f) of the Land and Water Conservation Fund Act of 1965 will be included in the Environmental Impact Statement (EIS).

14.2. Regulatory Context and Guidance

The following laws, regulations, and agency jurisdiction and management guidance are pertinent to parks resources. Key regulations that are most relevant to the Long Bridge Project are listed below.

14.2.1. Parks and Recreation Federal Laws, Regulations, and Other Guidance

Parks and recreation areas are subject to regulation by multiple Federal agencies and multiple legislative and regulatory vehicles.

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- National Capital Planning Act of 1952⁴⁴³
- National Park Service (NPS) Organic Act of 1916 (NPSOA)⁴⁴⁴
- National Trails System Act of 1968⁴⁴⁵
- NPS Director's Order 12 (DO-12): Conservation Planning, Environmental Impact Analysis, and Decision Making⁴⁴⁶
- Section 4(f) of the U.S. Department of Transportation Act of 1966⁴⁴⁷
- U.S. Land and Water Conservation Fund (LWCF) Act of 1965⁴⁴⁸

⁴⁴³ 40 USC 8701-8737

⁴⁴⁴ 16 USC 1-4

⁴⁴⁵ Public Law 90-543

⁴⁴⁶ National Park Service (NPS) Director's Order 12

⁴⁴⁷ 49 USC 303

⁴⁴⁸ 16 USC 4601-4

Relevant Federal Guidance:

- NPS National Mall Plan (2010)⁴⁴⁹

14.2.2. Parks and Recreation State and Local Laws, Regulations, and Other Guidance

Relevant State and Local Guidance

District departments with jurisdiction over parks and recreation areas near Long Bridge include the District of Columbia Department of Parks and Recreation, the District of Columbia Office of Planning, and the District of Columbia Office of Zoning. Parks and recreation areas are managed by these departments through the development and implementation of plans including:

- DC Parks and Recreation Master Plan (2015)⁴⁵⁰
- Southwest Neighborhood Plan (2015)⁴⁵¹

The Arlington County Department of Parks and Recreation and the Arlington County Department of Community Planning, Housing, and Development have jurisdiction over parks and recreation areas near Long Bridge. Parks and recreation areas are managed by these departments through the development and implementation of plans, including:

- Master Plan for the North Tract Park and Recreational Facilities and the Surrounding Area (2004), which provides the blueprint for continuing development of Long Bridge Park⁴⁵²
- General Land Use Plan, which establishes policy for land-use decisions and development in Arlington, including open space⁴⁵³
- Public Spaces Master Plan (2005, currently being updated), which identifies the major public space needs of the community⁴⁵⁴

Relevant State and Local Guidance:

- There are no relevant state and local guidance for this resource.

⁴⁴⁹ NPS. 2010. National Mall Plan. Accessed from <https://www.nps.gov/nationalmallplan/national%20mall%20plan.html>. Accessed April 29, 2018.

⁴⁵⁰ District of Columbia. 2015. Play DC Master Plan Vision + Implementation Framework. Accessed from <https://dpr.dc.gov/publication/play-dc-master-plan-vision-implementation-framework>. Accessed April 29, 2018.

⁴⁵¹ District Office of Planning. Undated. Southwest Neighborhood Plan. Accessed from <https://planning.dc.gov/publication/southwest-neighborhood-plan>. Accessed April 29, 2018.

⁴⁵² Concepts and Plan for Long Bridge Park. Accessed from <https://projects.arlingtonva.us/plans-studies/parks-open-space/long-bridge-park/concepts-plan-long-bridge-park/>. Accessed April 29, 2018.

⁴⁵³ Arlington County General Land Use Plan. Accessed from <https://projects.arlingtonva.us/plans-studies/general-land-use-plan/>. Accessed April 29, 2018.

⁴⁵⁴ Public Spaces Master Plan. Accessed from <https://projects.arlingtonva.us/plans-studies/comprehensive-plan/public-spaces-master-plan/>. Accessed April 29, 2018.

14.3. Study Area

As shown in **Figure 14-1**, the Local Study Area for parks and recreation areas includes the footprint of the Project Area and the areas immediately adjacent to the Project Area within approximately 0.25-mile distance of the existing bridge alignment. The Local Study Area includes all parks and recreation areas within a distance for which the Project may have a potential direct or indirect effect, and is consistent with the Local Study Area for other resources evaluated in this EIS. Because the potential direct or indirect effects would be at a local level, a Regional Study Area was not considered.

14.4. Methodology

Publicly accessible parks and recreation areas were documented within the Study Area by identifying:

- Parklands located within the Study Area, and providing the name, location, and ownership. The total area (acres) within the Study Area was estimated, and acres of parklands presented in tables and in maps using Geographic Information Systems (GIS). The intended purposes of the parkland (active or passive recreation) were also noted.
- Areas sensitive to noise and vibration, and visual and aesthetic changes to natural landscape.
- Potentially sensitive areas (such as conservation land, resource management areas, and public recreational facilities).

Data sources used to inform the affected environment analysis for parks and recreation areas include:

- Arlington County GIS Data
- District of Columbia GIS Data
- Consultation with the NPS
- Local and regional parks and open space plans, including:
 - NPS National Mall Plan (2010)
 - National Capital Planning Commission (NCPC) Capital Space Plan (2010) and 2012 Progress Report
 - NCPC SW Ecodistrict Plan (2013) and 2014 Addendum
 - DC Parks and Recreation Master Plan (2015)
 - DC Southwest Neighborhood Plan (2015)
 - Arlington County Master Plan for the North Tract Park and Recreational Facilities and the Surrounding Area (2004)
 - Arlington County Public Spaces Master Plan (2005)
 - National Trails System Map⁴⁵⁵

⁴⁵⁵ NPS. Undated. National Trails Maps. Accessed from <https://www.nps.gov/nts/maps/National%20Trails%20map.pdf>. Accessed December 24, 2017.

Figure 14-1 | Parks and Recreation Areas Within the Study Area



14.5. Affected Environment

This section describes the existing parks and recreation areas within the Study Area. **Table 14-1** identifies the parks and recreation areas within the Study Area, the agency with jurisdiction over the property, the estimated property size, and highlighted amenities and features of the listed parks and recreation areas. **Figure 14-1** shows these parks and recreation areas in context of the Study Area.

Fifteen parks and recreation areas are located in or partially within the Study Area, as shown in **Figure 14-1**. The majority of these areas are owned by the NPS. All the parks and recreation areas in the Study Area are easily accessible by foot, bicycle, or vehicle. The East Potomac Park, the George Washington Memorial Parkway, and the Long Bridge Park are the most significant parks and recreation areas resource within the Study Area; Long Bridge directly abuts or overlaps with these areas.

On the southern end of the Study Area in Arlington, Virginia, the railroad right-of-way runs through Long Bridge Park and crosses over the George Washington Memorial Parkway (GWMP) and the Mount Vernon Trail before crossing the Potomac River. Since 2011, Long Bridge Park has been transformed from a brownfield into a high-quality green space and recreation area for visitors and residents of Arlington, Virginia.⁴⁵⁶ The park provides active and passive recreation amenities including athletic fields, a network of walkways, and picnic areas. The park is commonly used for train-, plane-, and birdwatching, and includes a vehicle parking lot. The railroad right-of-way runs along the eastern edge of the Long Bridge Park athletic field complex at the same grade as the park, but it is screened from view by landscape and hardscape features.

The railroad right-of-way crosses over the GWMP immediately south of Long Bridge. Residents and congressional representatives envisioned a parkway along the southern side of the Potomac River as early as the late 1800s.⁴⁵⁷ The alignment of the GWMP recognized today was substantially in place by the 1930s, and was fully completed in the 1970s. The parkway offers a scenic, recreational driving route and pedestrian and bicycle trails, and connects important sites of American history along the Potomac River.^{458, 459} The Mount Vernon Trail is a multimodal trail that runs along the edge of the Potomac River and is part of the GWMP.

⁴⁵⁶ Friends of Long Bridge Park. The Long Bridge Park Connection, Spring 2013 Issue. 2013. Accessed from http://www.longbridgepark.org/FoLBP_Newsletter_Spring2013.pdf. Accessed January 24, 2018.

⁴⁵⁷ Davis, Timothy; Croteau, Todd & Payne, R.D. A Model Parkway. Highways in Harmony: George Washington Memorial Parkway, Virginia, Maryland, Washington DC (Leaflet). Washington, DC: National Park Service. Accessed from https://web.archive.org/web/20121108090844/http://www.nps.gov/history/history/online_books/hih/%20george_washington/george_washington1.htm. Accessed December 17, 2018.

⁴⁵⁸ NPS. 2017. George Washington Memorial Parkway Accessed from <https://www.nps.gov/gwmp/index.htm>. Accessed December 17, 2017.

⁴⁵⁹ Friends of Long Bridge Park. 2017. Accessed from <http://longbridgepark.org/>. Accessed December 17, 2017.

Table 14-1 | Parks and Recreation Areas Within the Study Area

Name	Owner	Location	Size (acres)	Railroad Right-of-Way Relationship	Amenities and Features
Benjamin Banneker Park	NPS	10 th Street Overlook & Maine Avenue SW, Washington, DC	6.6	In Study Area	<ul style="list-style-type: none"> • Open space • Walkways • Landscaping • Overlook • Water fountain and plaza
Captain John Smith Chesapeake National Historic Trail (CAJO)	NPS- Chesapeake	Chesapeake Bay Region (DC, DE, MD, NY, PA, and VA)	---	Crossed by right-of-way (trail section follows Potomac River)	<ul style="list-style-type: none"> • First National Water Trail • In the Study Area sections of designated water trail along Potomac River are accessed from various sites supporting public access to the water
Earth Day Park	Department of Energy (DOE)	9 th Street SW, Washington, DC	N/A	In Study Area	<ul style="list-style-type: none"> • Open space • Technology demonstrations⁴⁶⁰

⁴⁶⁰ National Renewable Energy Laboratory. 1996. Earth Day Park in Washington, D.C. to be Solar Powered. Accessed from <https://www.nrel.gov/news/press/1996/earthpark.html>. Accessed December 17, 2017.

Name	Owner	Location	Size (acres)	Railroad Right-of-Way Relationship	Amenities and Features
East Potomac Park	NPS-National Mall and Memorial Parks (NAMA)	Ohio Drive SW, Washington, DC	330	Crossed by right-of-way	<ul style="list-style-type: none"> • Golf range • Tennis center • Swimming pools • NPS NAMA Headquarters and Maintenance Facilities • NPS National Capital Region Headquarters • U.S. Park Police District 1 Substation • Hains Point Loop Trail • Recreation fields • Rock Creek Park Trails • Thomas Jefferson Memorial • George Mason Memorial • Japanese cherry trees • Tidal Basin
George Washington Memorial Parkway	NPS	Arlington County, City of Alexandria, and Fairfax County, VA	7,146	Crossed by right-of-way	<ul style="list-style-type: none"> • Scenic Parkway • Mount Vernon Trail
Gravelly Point	NPS	George Washington Memorial Parkway, Arlington, VA	--	In Study Area	<ul style="list-style-type: none"> • Picnic areas • Aircraft observation • Boat launch • Potomac River overlook
Hancock Park (Reservation 113)	NPS-NAMA	C Street SW, Washington, DC	1.3	Adjacent to right-of-way	<ul style="list-style-type: none"> • Open Space • Walkways • Landscaping and screening

Name	Owner	Location	Size (acres)	Railroad Right-of-Way Relationship	Amenities and Features
Long Bridge Park	Arlington County and Virginia Department of Inland Fisheries	Long Bridge Drive, Arlington County, VA	30	Crossed by right-of-way	<ul style="list-style-type: none"> • Sports fields • Walkways • Overlook • Picnic areas • Rain garden • Roaches Run Waterfowl Sanctuary, for birding and observation • Bird and train watching • <i>Planned aquatics, health and fitness facility (Phase II)</i>
Mount Vernon Trail	NPS	Arlington County, City of Alexandria and Fairfax County, VA	--	Crossed by right-of-way	<ul style="list-style-type: none"> • Paved multi-use trail for non-motorized use
National Mall and Smithsonian Grounds	NPS-NAMA	7 th Street NW to 6 th Street NW and Constitution Avenue, Independence Avenue SW, Washington, DC	70.25	In Study Area	<ul style="list-style-type: none"> • National civic space used for events, protests, demonstrations, and recreation • Open space • Smithsonian museums • Landscaped gardens
Potomac Heritage National Scenic Trail	NPS	Potomac and Ohio River basins (DC, MD, PA, VA)	--	Crossed by right-of-way (trail section follows Potomac River)	<ul style="list-style-type: none"> • Currently includes 736 miles of existing trails and 126 miles of planned trails • In the Study Area follows GWMP and the Potomac River, supporting public access to the water
Reservation 197	NPS-NAMA	D Street SW Washington, DC	0.1	In Study Area	
Reservation 198	NPS-NAMA	Maryland Avenue, Washington, DC	0.2	In Study Area	

Name	Owner	Location	Size (acres)	Railroad Right-of-Way Relationship	Amenities and Features
Roaches Run Waterfowl Sanctuary	NPS	George Washington Memorial Parkway, Arlington, VA	--	In Study Area	<ul style="list-style-type: none"> Bird sanctuary and observation area
Star-Spangled Banner National Historic Trail	NPS	Chesapeake Bay Region (DC, MD, and VA)	--	Crossed by right-of-way (trail section follows George Washington Parkway)	<ul style="list-style-type: none"> Path traces 680 miles of land and water trails followed by the allied armies under General Washington and General Rochambeau West of the Study Area this trail follows S. Lynn Street, S. Joyce Street, and Eisenhower Drive (through Arlington National Cemetery)
Washington Monuments & Ground	NPS-NAMA	14 th to 17 th Streets, E Street NW to East Potomac Park, Washington, DC	104	In Study Area	<ul style="list-style-type: none"> Washington Monument Theater Gardens Tidal Basin Paddle boating Cherry blossom plantings Trails
West Potomac Park	NPS-NAMA	Ohio Drive SW, Constitution Avenue, 17 th Street NW, Washington, DC	400	In Study Area	<ul style="list-style-type: none"> Thomas Jefferson Memorial Lincoln Memorial Franklin Delano Roosevelt (FDR) Memorial World War II Memorial Tidal Basin Cherry blossom plantings Trails and sidewalks

East Potomac Park is located on a man-made island in the Potomac River in the District and is part of the National Mall and Memorial Parks network. The Park complex offers a wide range of amenities including a public golf course, memorials, a public swimming pool, picnic areas, parking areas, and extensive roads

and paths for cyclists, walkers, and runners. The Jefferson Memorial and George Mason Memorial are located within this park on the southern edge of the Tidal Basin. Long Bridge crosses through East Potomac Park, entering the park from the southern bank of the Potomac River, crossing northwest over the man-made island, and crossing over the inlet connecting the Tidal Basin to the Washington Channel. The railroad right-of-way passes approximately 800 feet from the Jefferson Memorial grounds. The Haines Point Loop Trail runs along the north bank of the Potomac River on the southwestern side of East Potomac Park; as the Long Bridge approaches the island from the Potomac River, it also bridges the Haines Point Loop Trail before reaching the bridge footing. Through East Potomac Park, the railroad right-of-way is obscured by vegetative screening and is only partially visible from passive and active recreation areas within the park.

West Potomac Park is located on the north bank of the Potomac River, north of the railroad right-of-way. It borders the northwest side of the Tidal Basin, and is connected to East Potomac Park via the Tidal Basin Inlet Bridge at the southwest inlet to the Tidal Basin. The bridge allows vehicles, pedestrians, and cyclists to move between the two parks; it is an important connector for pedestrians and cyclists making the loop around the Tidal Basin. West Potomac Park offers various amenities, including active and passive recreation areas, parking areas, memorials, and extensive roads and paths for cyclists, walkers, and runners. The Lincoln Memorial, Reflecting Pool, National World War II Memorial, and FDR Memorial are some of the memorials located within the park. Although West Potomac Park is within the Study Area, the railroad right-of-way does not pass through the park and the railroad right-of-way and bridges (including Long Bridge) are obscured from view from within the park by the 14th Street Bridge.

Within the northern portion of the Study Area, several publicly owned parks and recreation areas have been identified, including the Benjamin Banneker Park, part of the National Mall and Smithsonian Grounds, Earth Day Park, and Hancock Park. The railroad right-of-way does not pass through any park or recreation area in the northern end of the Study Area, but it does border the southern edge of Hancock Park (NPS Reservation 113), as well as Reservation 197 and 198. For the length of the park, the railroad right-of-way is located at the same grade as the park, with only limited vegetative screening and a chain link fence between the park and the railroad tracks.

15.0 Social and Economic

15.1. Overview

This section describes the affected environment related to demographics, jobs, current economic conditions, taxes, revenue, community facilities, local government services, and commercial activity. The social and economic impact assessment considers the Project's potential to impact the socioeconomic environment, including community disruption or cohesion; demographic shifts; impacts to existing commerce and new commercial activity; job creation; and tax revenues.

15.2. Regulatory Context and Guidance

The following laws, regulations, agency jurisdictions, and guidance are pertinent to social and economic resources. Key regulations and guidance that are most relevant to the Long Bridge Project are listed below.

15.2.1. Social and Economic Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- EO 13045 of April 23, 1997: Protection of Children from Environmental Health Risks and Safety Risks⁴⁶¹

Relevant Federal Guidance:

- Federal Railroad Administration (FRA) Procedures for Considering Environmental Impacts⁴⁶²

15.2.2. Social and Economic State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- District of Columbia, DC Code §§ 8-109.01 – 8.109.12, Subchapter V: Environmental Impact Statements⁴⁶³

⁴⁶¹ EO 13045

⁴⁶² 64 FR 28545

⁴⁶³ DC Code 8-109.01 – 8.109.12. Subchapter V: Environmental Impact Statements. Accessed from <https://code.dccouncil.us/dc/council/code/titles/8/chapters/1/subchapters/V/>. Accessed January 15, 2018.

Relevant State and Local Guidance:

- Virginia Department of Environmental Quality (VDEQ), Procedure Manual: Environmental Impact Review of Major State Facilities (July 2013)⁴⁶⁴

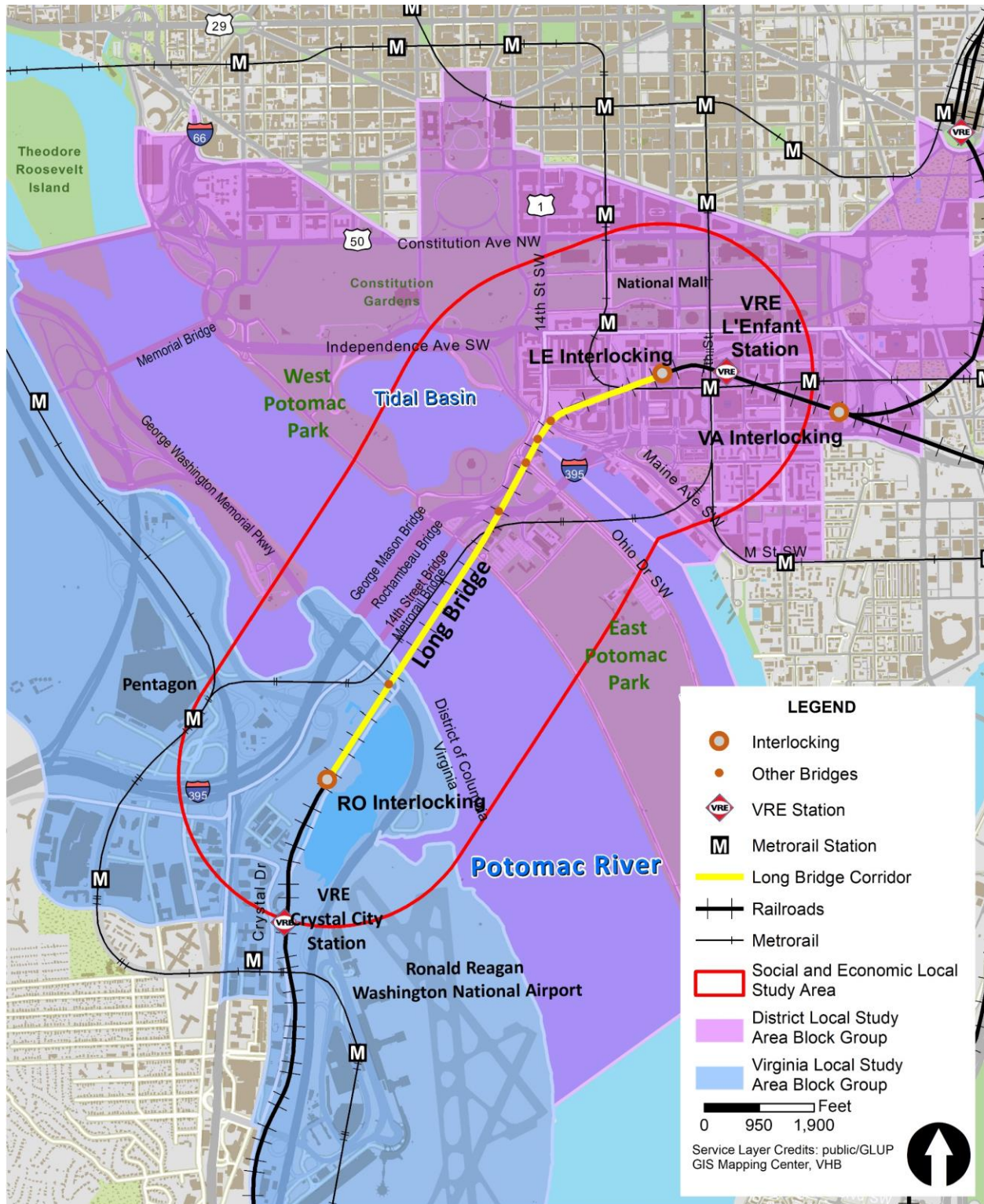
15.3. Study Area

The northern (District) and southern (Virginia) portions of the Project are both located in relatively dense urban areas. The Local Study Area includes the Project Area, which spans from the midblock between 9th Street SW and 10th Street SW in the District and Long Bridge Park in Arlington County, Virginia, as well as 0.5 miles immediately adjacent to the Project Area. The U.S. Census 2010 block groups are the smallest geographic unit for which all the demographic data collected for this analysis are available; therefore, some analyses that rely on U.S. Census information capture data that extends beyond the Local Study Area including the entirety of the 17 block groups that are located within or intersect the 0.5-mile Local Study Area. The Local Study Area can be divided into the District and Arlington County, Virginia, block groups (the “District block groups” and “Virginia block groups”) to capture any unique conditions between the two jurisdictions. **Figure 15-1** identifies the geographic boundary of the Local Study Area. A Regional Study Area was not designated since social and economic impacts of the Project are not expected to extend beyond the Local Study Area.

Given that tax receipts are measured on a District-wide basis in the District and a County-wide basis in Arlington, Virginia, some sections will include discussion on a regional basis, including the entirety of the District and Arlington County.

⁴⁶⁴ Virginia Department of Environmental Quality. July 2013. Procedure Manual: Environmental Impact Review of Major State Facilities. Accessed from http://townhall.virginia.gov/l/GetFile.cfm?File=C:%5CTownHall%5Cdocroot%5CGuidanceDocs%5C440%5CGDoc_DEQ_2170_v6.pdf. Accessed January 15, 2018.

Figure 15-1 | Local Study Area for Social and Economic Resources



15.4. Methodology

This section identifies existing social, demographic, and economic characteristics of the Study Area, drawing from the following sources:

- U.S. Census Bureau, 2010 Decennial Census
- U.S. Census Bureau, American Community Survey (ACS) 2011–2015 5-Year Estimates
- Metropolitan Washington Council of Governments (MWCOC) Cooperative Land Use Forecasts (Round 9.0)
- District of Columbia Office of Tax and Revenue
- Arlington County Office of the Treasurer
- District of Columbia Geographic Information Systems (GIS) Data
- Arlington County GIS Data
- *DC's Economic Strategy, Strategy Report*, prepared by the DC Office of the Deputy Mayor for Planning and Economic Development in March 2017
- *DC Tax Facts*, 2017, prepared by the DC Office of the Chief Financial Officer, Office of Revenue Analysis

The socioeconomic profiles presented in this section include the following indicators:

- Demographics, including total population and population by age, sex, race, and median income;
- Community facilities in the Study Area, including libraries, schools, community centers, place of worship, and emergency response facilities;
- Community facilities that would be expected to serve high concentrations of children, such as schools, community and recreational facilities, and daycare centers;
- Jobs by type and location;
- Taxes and other public revenues;
- Current economic conditions of the neighborhood(s);
- Commercial activity and locations and types of businesses; and
- Other local government services.

15.5. Affected Environment

The Project is located within relatively dense urban areas with prominent commercial and institutional districts and smaller but growing concentrations of residential and mixed-use neighborhoods. Prominent institutions include the National Mall and Memorial Parks, the White House, the U.S. Capitol Building, several Federal government agencies, L'Enfant Plaza, and East Potomac Park and West Potomac Park in the District, as well as the Pentagon, Arlington National Cemetery, Ronald Reagan Washington National Airport, and Long Bridge Park in Virginia. Significant employment sectors in the Study Area are the Federal government; services, such as education institutions, hotels, and museums; and retail trade,

including shopping malls. There are more employees than residents in both the District and Virginia portions of the Study Area; however, the Study Area also contains emerging mixed-use neighborhoods such as District Wharf in the District and Crystal City and Pentagon City in Virginia. These developing urban centers provide a mix of high-rise residential, commercial, and cultural uses contributing to the economic diversity of the Study Area.

15.5.1. Demographics

This section outlines the demographic characteristics of the Study Area residents within the District and Virginia block groups. As detailed below, a large proportion of Study Area residents are in their 20s and 30s and have relatively high incomes. Generally, however, residential uses make up a small proportion of land uses in the Study Area, as described in **Section 10.0, Land Use and Property**. In the District, the Study Area mostly consists of public- and government-related land uses, with a small but growing proportion of residential uses particularly in the Southwest Waterfront neighborhood. The Virginia portion of the Study Area also has a small proportion of the area devoted to residential uses, in portions of Crystal City, Pentagon City, and the neighborhood of Aurora Highlands.

Age

According to the 2011–2015 ACS 5-Year Estimates, the total population of the Study Area in 2015 was 18,101, with 13,620 people residing within the Virginia block groups and 4,481 within the District block groups (see **Table 15-1**). The total Study Area population increased by 694, or 6.2 percent, from 2010. Most of this increase occurred within the District block groups. The age cohort with the largest population increase from 2010 was 30–39 years old (+24.5 percent). The cohort with the greatest decline in population from 2010 was 18–21 years old (-16.4 percent).

Race

As detailed in **Section 18.0, Environmental Justice**, of the total 18,101 residents in the Study Area in 2015, 10,569, or approximately 58.4 percent, were White. Black or African Americans made up approximately 16.3 percent of the 2015 Study Area population. The Black or African American population made up a more significant portion of the population within the District block groups at 35.9 percent compared with the Virginia block groups at 9.8 percent. The Asian Study Area population was 2,628 (14.5 percent) and the Hispanic or Latino population was 1,222 (6.8 percent) in 2015.

Median Household Income

The median household income for the Virginia block groups is \$102,037, comparable to the median household income of \$104,869 for Arlington County, Virginia. The median household income for the District block groups is \$97,125, compared with a median household income of \$76,405 for the entire District.⁴⁶⁵

⁴⁶⁵ ESRI Business Analyst. 2017. Community Profile, Forecasts for 2017. Accessed on December 6, 2017.

Table 15-1 | Study Area Population by Age

Age Cohort	2010			2015			Percent Change
	DC	VA	Total	DC	VA	Total	Total
Under 18 Years	216	842	1,058	308	848	1,156	9.3%
18 to 21 Years	63	248	311	20	240	260	-16.4%
22 to 29 Years	926	4,557	5,483	922	4,134	5,056	-7.8%
30 to 39 Years	834	3,006	3,840	1,440	3,342	4,782	24.5%
40 to 49 Years	522	1,663	2,185	448	1,899	2,347	7.4%
50 to 64 Years	759	2,027	2,786	766	1,882	2,648	-5.0%
65 Years and Over	480	1,264	1,744	577	1,275	1,852	6.2%
Total	3,800	13,607	17,407	4,481	13,620	18,101	4.0%

Source: 2010 U.S. Census, 2011-2015 ACS 5-year Estimates

15.5.2. Community Facilities

Community facilities considered for this analysis include schools, community centers, recreational facilities, places of worship, emergency service centers, and childcare centers that are located within the 0.5-mile radius of the Project. As the Project is located within relatively dense urban areas with prominent commercial and institutional districts, community facilities are largely concentrated closer to adjacent residential areas, including the Southwest Waterfront neighborhood in the District and the residential areas of Crystal City in Virginia. **Figure 15-1** shows the locations of community facilities within the Study Area.

Arlington, Virginia

The Aurora Hills Community Center, Aurora Hills Library, and Arlington County Fire Station 5 are all located within the Virginia block groups of the Study Area. The Community Center largely serves as a senior center. Places of worship within the Study Area include the Great Commission Community Church and Calvary United Methodist Church. There are also several parks, detailed in **Section 14.0, Parks and Recreation**, including Long Bridge Park, with recreational fields, picnic areas, and walking paths; George Washington Memorial Parkway; Gravelly Point; the Mount Vernon Trail; and the Roaches Run Waterfowl Sanctuary. There are no libraries located within the Study Area.

District of Columbia

There are four schools within the District block groups of the Study Area: Washington Global Public Charter School, Jefferson Middle School Academy, Amidon-Bowen Elementary School, and the AppleTree Early Learning Public Charter School. There are also numerous churches, including Saint Dominic Catholic Church, Riverside Baptist Church, Westminster Presbyterian, and the Christ United Methodist Church. The Southwest Neighborhood Library is located within the Study Area. Emergency Service facilities include the Washington, DC Fire and EMS Engine 13 Station. As outlined in **Section 14.0, Parks and Recreation**, numerous recreational facilities are also located within the Study Area, including

the National Mall; West Potomac Park; several monuments and associated grounds, of which a few are located within West Potomac Park; East Potomac Park, with an outdoor pool facility, tennis center, walking trails, and golf range; and several other smaller open spaces and trails that cross through the Study Area. There are no libraries located within the Study Area.

15.5.3. Community Facilities Serving Children

Several types of facilities in the Study Area would be expected to serve high concentrations of children, including the schools and open space or recreational facilities identified above, particularly the open spaces with fields or playground equipment. In addition, though not identified above, there are a number of childcare facilities, including day care centers and pre-school programs, located within the 0.5-mile radius of the Project in both the Virginia and District block groups.

15.5.4. Employment, Commercial Activity, and Current Economic Conditions

There are substantially more employees than residents in both the District and Virginia portions of the Study Area. Dominant employers in the Study Area include the Federal government, hotels, retail stores and shopping malls, cultural and educational institutions, and Federal contractors. **Table 15-2** shows the number of businesses and employees in each business sector in the Study Area.

Arlington, Virginia

In the Virginia portion of the Study Area, there are 23,432 employees at 1,150 businesses. The sectors with the most employees include services (50.9 percent of employees), retail trade (27.3 percent), finance, insurance, real estate (6.7 percent), and manufacturing and defense contractors (4.4 percent). Subcategories with the most employees in the services sector are hotels and lodging, legal services, and other services.⁴⁶⁶ These data only include civilian employees; therefore, an additional 23,000 employees at the Pentagon are not included in these data.

Significant economic centers in the Virginia portion of the Study Area include Crystal City, Pentagon City, the Pentagon, and Ronald Reagan Washington National Airport.

Crystal City is a mixed-use neighborhood with approximately 7,800 residential units, 11 million square feet of office space, 1 million square feet of retail space, and over 5,000 hotel rooms. Crystal City formerly contained the offices of several Federal government and military agencies and contractors. Many of these offices closed in the early 2000s following the U.S. Department of Defense Base Realignment and Closure (BRAC) process, which moved a substantial number of functions out of the nearby Pentagon complex and resulted in the loss of approximately 13,000 jobs and vacancy of more than 3 million square feet of office space.⁴⁶⁷ Commercial uses in the neighborhood have since diversified

⁴⁶⁶ ESRI. Undated. Business Summary. Accessed on December 6, 2017.

⁴⁶⁷ Arlington County. Undated. Crystal City Development. Accessed from <https://projects.arlingtonva.us/neighborhoods/crystal-city-development/>. Accessed on January 1, 2018.

with tech start-ups, co-working spaces, private recreation, and restaurants.⁴⁶⁸ Crystal City Shops, an underground shopping mall, is also located in Crystal City.

Table 15-2 | Study Area Employment

Industry Sector	District of Columbia			Arlington County, VA ¹		
	Businesses	Employees	Employees %	Businesses	Employees	Employees %
Agriculture and Mining	5	3,639	4.4%	2	5	0.0%
Construction	27	341	0.4%	35	860	3.7%
Manufacturing	28	2,422	3.0%	27	1,035	4.4%
Transportation	27	2,258	2.8%	24	458	2.0%
Communication	20	796	1.0%	14	484	2.1%
Wholesale Trade	15	141	0.2%	18	244	1.0%
Retail Trade	191	4,100	5.0%	346	6,405	27.3%
Finance, Insurance, Real Estate	97	1,563	1.9%	125	1,575	6.7%
Services	515	20,099	24.6%	427	11,920	50.9%
Government	687	45,950	56.2%	16	230	1.0%
Unclassified Establishments	188	488	0.6%	116	216	0.9%
Total	1,800	81,797	100.0%	1,150	23,432	100.0%

Source: ESRI Business Summary accessed on December 6, 2017. Sector is by Standard Industrial Classification (SIC) Codes.

Notes: ¹ U.S. Census data and ESRI estimates count civilian employees, which excludes people on active duty in the United States Armed Forces. The Pentagon is the headquarters of the U.S. Department of Defense and the approximately 23,000 people employed there are not included in U.S. Census data or ESRI estimates.

Pentagon City is also a mixed-use neighborhood located in Arlington County. Economic activity in Pentagon City includes Federal agencies, general office uses, and hotels, as well as retail uses at the Fashion Centre at Pentagon City and Pentagon Row. The nearby Pentagon is occupied by the headquarters of the U.S. Department of Defense. The building contains more than 6 million square feet of floor space and is a significant employer in the region, with approximately 23,000 employees.⁴⁶⁹

Arlington National Cemetery, in the northwest portion of the Study Area, encompasses 624 acres and is visited by more than 4 million people annually.⁴⁷⁰ Ronald Reagan Washington National airport is located in the southern portion of the Study Area. The airport serves Arlington County and the DC region.

⁴⁶⁸ Arlington County. Crystal City Development.

⁴⁶⁹ Pentagon Tours. Accessed from <https://pentagontours.osd.mil/Tours/facts.jsp>. Accessed December 8, 2017.

⁴⁷⁰ Arlington Tours. Accessed from <https://www.arlingtontours.com>. Accessed December 8, 2017.

District of Columbia

In the District portion of the Study Area, there are 81,797 employees and 1,800 businesses. The leading sectors in terms of employment include government (20.6 percent of employees), services (24.6 percent), and retail trade (5.0 percent). Subcategories with the most employees in the services sector are educational institutions and libraries, motion pictures and amusements, and other services, which includes research institutions and museums.⁴⁷¹

The developing District Wharf neighborhood (commonly referred to as the Wharf) is just east of Long Bridge. The Wharf is a 1-mile-long planned community along the Washington Channel. At full build-out, anticipated to be completed in 2022, this community will contain a mix of 1,400 residential units, retail uses, and recreation space with some unique uses such as a marina, piers, and a concert hall and conference center. The first phase has been completed. It is anticipated that the new commercial uses at the Wharf will serve the new residents as well as tourists and other visitors.⁴⁷²

The Portals, which at full build-out will be a \$1 billion mixed-use development adjacent to L'Enfant Plaza, consists of the 400-room Mandarin Oriental hotel and three office buildings with approximately 1.5 million square feet of office space, leased to a mix of Federal and private tenants, including the Federal Communications Commission. The next phase of the Portals development is underway, with Portals V, a 373-unit residential tower, anticipated to be completed in 2019. The final phase of the development is anticipated to include construction of a fourth large-scale office building on the site.

The middle and northern portions of the Study Area on the District side of the Potomac River are mostly comprised of the National Mall, the White House, the U.S. Capital, memorials, monuments, museums, and Federal offices. The primary economic sectors in this area are government services and tourism.

The Study Area in the District also includes L'Enfant Plaza, a commercial development with four office buildings and an underground shopping mall served by a major Metro station which connects five Metro lines and two VRE lines. The L'Enfant Station is VRE's busiest station.

15.5.5. Taxes, Public Revenue, and Local Government Services

Arlington, Virginia

Arlington County, Virginia, is the local governing entity that collects revenues and provides local services. Arlington collected approximately \$1.2 billion in revenues in FY 2017. The largest revenue source is real estate taxes. The 2017 real estate property base tax rate was \$0.983 per \$100 of assessed value. Arlington cannot have differentiated rates for different property types without state authorization. The second largest revenue source was the personal property tax, levied on tangible property of individuals and businesses. The 2017 personal property and business tangible tax rate was

⁴⁷¹ ESRI. Undated. Business Summary. Accessed on December 6, 2017.

⁴⁷² District Wharf. Accessed from <https://www.wharfdc.com/>. Accessed December 11, 2017.

\$5 per \$100 of assessed value. The 2017 sales tax was 1 percent, and the tax on food and beverages was 4 percent on top of the sales tax.⁴⁷³

Some revenue streams are dedicated to specific funds, but the majority is allocated to the general fund. Government services include police, fire, public safety communications and emergency management, public education, human services, parks and recreation, environmental services, and water and sanitation services.

District of Columbia

The District provides services and collects revenues typical of states and local municipalities. The District's largest revenue sources are real property taxes, individual income taxes, sales taxes and gross receipts taxes. In Fiscal Year (FY) 2017, the District estimates it will collect approximately \$8.4 billion in revenue from taxes, fees, and other sources. Real property tax rates vary according to property type; however, all nonexempt real property is taxed at 100 percent of estimated market value.

Owner-occupied residences receive a homestead deduction and cap on increases. The 2017 tax rate for owner-occupied residences was \$0.85 per \$100 of assessed value. Commercial and industrial properties are subject to a split tax structure with the first \$3 million in assessed value taxed at \$1.65 per \$100 of assessed value and additional assessed value taxed at \$1.85 per \$100 of assessed value. By law, the amount of total revenue received annually from real property tax is capped by property type. The 2017 retail sales tax rate was 5.75 percent, although some goods and services are taxed at a higher rate (for example, restaurant meals are taxed at 10 percent, hotel rentals are taxed at 14.5 percent, and parking in commercial lots is taxed at 18 percent). Sales taxes apply to goods and services, except grocery-type foods, prescription and non-prescription drugs, and professional services, but include construction materials and business purchases of public utility services. Individual income taxes are progressive and vary according to income levels.⁴⁷⁴

Some revenue streams are dedicated to specific funds or services; however, most revenue is allocated to the District's general fund. Government services include: police, fire, emergency medical services, public education, human services, child and family services, parks and recreation, environmental protection, public health services, and sanitation services. Several of these services are described in **Section 14.0, Parks and Recreation; Section 16.0, Public Health, Elderly, and Persons with Disabilities;** and **Section 17.0, Security and Safety**. Other governmental services typical of state and local governments are also provided.

⁴⁷³ FY 2017 Proposed Budget, County Board Work Session Presentation, March 3, 2016.

⁴⁷⁴ District of Columbia. DC Tax Facts 2017. Accessed from <https://cfo.dc.gov/sites/default/files/dc/sites/ocfo/publication/attachments/Tax%20Facts%202017.pdf>. Accessed May 9, 2018.

16.0 Public Health, Elderly, and Persons with Disabilities

16.1. Overview

This chapter describes the affected environment as it relates to the issues of public health, elderly, and persons with disabilities. The Affected Environment includes conditions in the Project Area, as well as the Local Study Area.

16.2. Regulatory Context and Guidance

There is a substantial Federal regulatory context for the issues of public health, elderly, and persons with disabilities. The U.S. Environmental Protection Agency (EPA) is principally responsible for issues of public health caused by environmental factors. The U.S. Department of Health and Human Services (HHS) is the lead public health agency in the country. Different Executive Orders (EOs) outline the Federal government's interest in accounting for public health issues in Federal actions. Federal Railroad Administration (FRA) regulations require consideration of impacts to the elderly and those with disabilities.

Compliance with Federal, state, or local laws and regulations requires coordination with the applicable agency or agencies. It is important to note that FRA's Procedures for Considering Environmental Impacts includes the topic of public health as part of the contents of an Environmental Impact Statement (EIS).⁴⁷⁵ National Environmental Policy Act (NEPA) regulations do not require quantitative analysis regarding public health; however, environmental, social, demographic, and economic conditions drive the health and well-being of communities and will be considered as part of this analysis.

The following laws, regulations, and agency jurisdiction and management guidance are pertinent to public health, elderly, and persons with disabilities. Key regulations that are most relevant to the Long Bridge Project are listed below.

16.2.1. Public Health, Elderly, and Persons with Disabilities Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and EOs:

- EO 12898 of February 11, 1994: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations⁴⁷⁶
- EO 13045 of April 23, 1997: Protection of Children from Environmental Health Risks and Safety Risks⁴⁷⁷

⁴⁷⁵ 64 FR 28545

⁴⁷⁶ EO 12898. February 11, 1994. Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Accessed from <https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf>. Accessed January 11, 2018.

⁴⁷⁷ EO 13045

- EPA Memorandum. Promoting the Use of Health Impact Assessment to Address Human Health in Reviews Conducted Pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act⁴⁷⁸
- National Ambient Air Quality Standards⁴⁷⁹
- Safe Drinking Water Act of 1974⁴⁸⁰
- Clean Water Act of 1972⁴⁸¹
- Federal Water Pollution Control Act (Clean Water Act) of 1972 as amended by the U.S. Clean Water Act of 1977 and the Water Quality Act of 1987⁴⁸²
- Occupational Safety and Health Administration (OSHA) Lead in Construction Standard⁴⁸³
- EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) Regulations⁴⁸⁴
- Standards and Practices for All Appropriate Inquiries (AAI) under the Federal Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA)⁴⁸⁵
- Americans with Disabilities Act of 1989⁴⁸⁶
- Transportation Services for Individuals with Disabilities⁴⁸⁷

Relevant Federal Guidance

- EPA Memorandum—"Promoting the Use of Health Impact Assessment to Address Human Health in Reviews Conducted Pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act"⁴⁸⁸

⁴⁷⁸ U.S. Environmental Protection Agency. 2015. Promoting the Use of Health Impact Assessment to Address Human Health in Reviews Conducted Pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act. Accessed from https://www.epa.gov/sites/production/files/2016-03/documents/hia_memo_from_bromm.pdf. Accessed January 11, 2018.

⁴⁷⁹ 40 CFR 50

⁴⁸⁰ 42 USC 300f

⁴⁸¹ 33 USC 1251

⁴⁸² 33 USC 1251

⁴⁸³ OSHA. Undated. Lead in Construction Standard. Accessed from https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10641. Accessed January 11, 2018.

⁴⁸⁴ National Emission Standards for Hazardous Air Pollutants. Accessed from <https://www.law.cornell.edu/cfr/text/40/part-61>. Accessed January 11, 2018.

⁴⁸⁵ 40 CFR 312

⁴⁸⁶ U.S. Department of Justice. Undated. The Americans with Disabilities Act of 1990 and Revised Regulations Implementing Titles II and III. Accessed from https://www.ada.gov/2010_regs.htm. Accessed July 27, 2017.

⁴⁸⁷ 49 CFR 37

⁴⁸⁸ U.S. Environmental Protection Agency. 2015. "Promoting the Use of Health Impact Assessment to Address Human Health in Reviews Conducted Pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act." Accessed from https://www.epa.gov/sites/production/files/2016-03/documents/hia_memo_from_bromm.pdf. Accessed January 11, 2018.

- Federal Transit Administration (FTA) Americans with Disabilities Act Guidance.⁴⁸⁹

16.2.2. Public Health, Elderly, and Persons with Disabilities State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- District of Columbia Fire Code⁴⁹⁰
- District of Columbia Construction Codes Supplement⁴⁹¹
- District of Columbia Municipal Regulations (DCMR), Title 24, Public Space and Safety⁴⁹²
- DCMR, Title 22-B, Public Health and Medicine⁴⁹³
- The District of Columbia Building Code includes a chapter (Chapter 11) on accessibility and notes that facilities should be designed and constructed with accessibility considerations for persons with physical disabilities.⁴⁹⁴

The standards that the Commonwealth of Virginia has adopted that protect public health, safety, and security include:

- Virginia Public Water Supply Law⁴⁹⁵
- Virginia Administrative Code, Title 19, Public Safety⁴⁹⁶
- Virginia Code, Title 9.1, Commonwealth Public Safety⁴⁹⁷
- Virginia Uniform State Building Code⁴⁹⁸
- Virginia Statewide Fire Prevention Code⁴⁹⁹

⁴⁸⁹ Federal Transit Administration (FTA). 2015. Americans with Disabilities Act Guidance. Accessed from https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Final_FTA_ADA_Circular_C_4710.1.pdf. Accessed May 1, 2018.

⁴⁹⁰ DCMR 12-H

⁴⁹¹ DCR 55.52

⁴⁹² DCMR 24

⁴⁹³ DCMR 22-B

⁴⁹⁴ DCMR 12-A11

⁴⁹⁵ Code of Virginia 32.1-167-176

⁴⁹⁶ Code of Virginia 19

⁴⁹⁷ Code of Virginia 9.1

⁴⁹⁸ Commonwealth of Virginia. Virginia Uniform State Building Code. Accessed from <http://www.dhcd.virginia.gov/index.php/va-building-codes/building-and-fire-codes/regulations/uniform-statewide-building-code-usbc.html>. Accessed June 13, 2017.

⁴⁹⁹ Commonwealth of Virginia. Virginia Statewide Fire Prevention Code. Accessed from <http://www.dhcd.virginia.gov/index.php/va-building-codes/building-and-fire-codes/regulations/statewide-fire-prevention-code-sfpc.html>. Accessed June 13, 2017.

- Arlington County Fire Prevention Code⁵⁰⁰
- Arlington County Code, Chapter 58, Emergency Management⁵⁰¹
- Arlington County Elderly Readiness Implementation Plan⁵⁰²

16.3. Study Area

The Project Area includes the tracks, interlockings, bridges, and related railroad infrastructure being modified by the Project. This area runs along the railroad right-of-way, between the RO Interlocking near Long Bridge Park in Arlington, Virginia, and the L'Enfant (LE) Interlocking near 10th Street SW in the District.

Unless otherwise noted, the Local Study Area (shown in **Figure 16-1**) includes the Project Area and 0.5 miles immediately adjacent to the construction footprint. It includes the tracks, interlockings, bridges, and related railroad infrastructure being modified by the Project. To the extent that the Local Study Area varies for referenced sections (**Section 3.0, Water Quality**; **Section 5.0 Solid Waste Disposal and Hazardous Materials**; and **Section 7.0, Air Quality**), the public health Regional Study Area mirrors those chapters.

Impacts related to elderly and disabled persons at a regional scale are considered unlikely due to the scope of this Project, and are therefore considered not applicable. Impacts to these populations are expected to be localized.

16.4. Methodology

The documentation of the Affected Environment for public health, the elderly, and persons with disabilities includes a summary of existing emergency medical services and accessibility barriers. The assessment considers existing populations of users within the Project Area and the Local Study Area that may face impacts from public health factors related to the Project. This section also describes the existing elderly and disabled population in the Local Study Area, as well as those who may use the existing infrastructure.

The description of the Affected Environment in the Local Study Area includes:

- The location of government facilities, hospitals, police stations, Fire and Emergency Medical Services (EMS) stations, and where public services are provided;
- District and regional policies concerning the provision of emergency medical services;
- Stakeholder issues, based on personal contact with local agencies;
- Railroad line access points and the security concerns associated with railroad yards within the Local Study Area.

⁵⁰⁰ Arlington County Code Chapter 8.1

⁵⁰¹ Arlington County Code Chapter 58

⁵⁰² Arlington County. Elder Readiness Implementation Plan. December 18, 2007. Accessed from <https://arlingtonva.s3.amazonaws.com/wp-content/uploads/sites/24/2013/12/Elder-Readiness-Implementation-Plan-2007.pdf>. Accessed May 3, 2018.

Figure 16-1 | Local Study Area for Public Health, Elderly, and Persons with Disabilities



Data sources included:

- U.S. EPA Human Health Risk Assessment Tools and Databases, and Guidelines⁵⁰³
- U.S. EPA Emergency Planning and Community Right-to-Know Act (EPCRA) existing Tier I and Tier II reports and other requirements under that law⁵⁰⁴
- U.S. Department of Health and Human Services health data
- District Department of Health, Arlington Department of Human Services, and Virginia Department of Health data
- Census data pertaining to the elderly/senior and disabled populations
- Available information on existing accessibility and Americans with Disabilities Act (ADA) compliance features (for example, ramps or elevators)

16.5. Affected Environment

Existing conditions related to public health are largely described elsewhere, in **Section 3.0, Water Quality**; **Section 5.0, Solid Waste Disposal and Hazardous Materials**; and **Section 7.0, Air Quality**. Of particular note within the Project Area is the use of diesel engines and the transportation of hazardous materials. All services south of Washington, both freight and passenger, employ diesel locomotives as the tracks are not electrified. Long Bridge Park is adjacent to the tracks and may receive some exhaust from the diesel trains. Additionally, freight trains operated by CSX may carry hazardous materials through the Project and Local Study Areas. In the case of a derailment or other incident, these hazardous materials may pose a risk to human health.

Elderly people are more susceptible to contaminants in the other related topic areas (Air Quality, Water Quality, Solid Waste Disposal, and Hazardous Materials). In the census tracts within the Local Study Area, Census estimates identify 335 persons over 65 (6.7 percent of the total population) in Arlington. In the District, there are approximately 468 persons over 65 (18.1 percent of the population) within the Local Study Area. There are no nursing homes or assisted living facilities within the Local Study Area. Several facilities serving elderly persons operate outside of this area; they include, but are not limited to, Regency Care of Arlington (1785 Hayes Street) and Aurora Hills Senior Center (735 18th Street S) in Arlington, and the Greenleaf Senior Center (1200 Delaware Avenue SW) in the District.

The Project Area is an active railroad right-of-way that is not open to the public. Therefore, Americans with Disabilities Act (ADA) compliance and accessibility are not relevant.

Regionally, the closest hospitals are Inova Alexandria in Alexandria, Virginia; Virginia Hospital Center in Arlington, Virginia; and George Washington University Hospital and Georgetown University Hospital in the District.

⁵⁰³ U.S. Environmental Protection Agency. Human Health Risk Assessment. <https://www.epa.gov/risk/human-health-risk-assessment>. Accessed June 2, 2017.

⁵⁰⁴ U.S. Environmental Protection Agency. Emergency Planning and Community Right-to-Know Act. <https://www.epa.gov/epcra> Accessed July 27, 2017.

17.0 Safety and Security

17.1. Overview

This chapter describes the affected environment as it relates to the issues of safety and security. The Affected Environment includes conditions in the Project Area, as well as the local and Regional Study Area.

Safety and security issues for railroad stations and travel are overseen by the Federal Railroad Administration (FRA), the Transportation Security Administration (TSA), the Department of Homeland Security (DHS), and Amtrak (including Amtrak Police). At the local level, public health issues are considered by the District Department of Health and the District Department of Energy & Environment (DOEE). Safety and security issues are enforced through local code requirements. The District Fire and Emergency Medical Services Department, Metropolitan Police Department, and Homeland Security and Emergency Management Agency are the local agencies responsible for safety and security issues.

17.2. Regulatory Context and Guidance

The following laws, regulations, and agency jurisdiction and management guidance are pertinent to safety and security. Key regulations that are most relevant to the Long Bridge Project are listed below.

17.2.1. Safety and Security Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and Executive Orders (EOs):

- Rail Safety Improvement Act of 2008⁵⁰⁵
- U.S. Code on Railroad Safety⁵⁰⁶
- Emergency Planning and Community Right-to-Know Act of 1986⁵⁰⁷
- Architectural Barriers Act of 1968⁵⁰⁸
- U.S. Department of Transportation Climate Adaptation Plan: Ensuring Transportation Infrastructure and System Resilience⁵⁰⁹

⁵⁰⁵ Public Law 110-432

⁵⁰⁶ 49 USC 20101

⁵⁰⁷ 42 USC 11001

⁵⁰⁸ 41 CFR C

⁵⁰⁹ U.S. Department of Transportation (USDOT). 2014. Climate Adaptation Plan 2014: Ensuring Transportation Infrastructure and System Resilience. Accessed from <https://www.transportation.gov/sites/dot.gov/files/docs/2014-%20DOT-Climate-Adaptation-Plan.pdf>. Accessed June 7, 2017.

- DHS and TSA, Rail Transportation Security⁵¹⁰

Relevant Federal and Other Guidance

- Amtrak safety and security procedures⁵¹¹
- High-Speed Passenger Rail Safety Strategy⁵¹²
- TSA—Security Directive RAILPAX-04-01 and RAILPAX-04-02⁵¹³
- National Fire Protection Association (NFPA) Standard for Fixed Guideway Transit and Passenger Rail Systems—NFPA 130⁵¹⁴

17.2.2. Safety and Security State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations

- District of Columbia Fire Code⁵¹⁵
- District of Columbia Construction Codes Supplement⁵¹⁶
- District of Columbia Municipal Regulations, Title 24, Public Space and Safety⁵¹⁷
- Virginia Public Water Supply Law⁵¹⁸
- Virginia Administrative Code, Title 19, Public Safety⁵¹⁹

⁵¹⁰ 49 CFR 1580

⁵¹¹ Amtrak is responsible for assessing and implementing safety and security measures for the NEC and its trains in the study area and commuter services, in collaboration with Amtrak, are responsible for assessing and implementing safety and security measures for their trains in the study area.

⁵¹² USDOT, Federal Railroad Administration. 2009. High-Speed Passenger Rail Safety Strategy. Accessed from <https://www.fra.dot.gov/eLib/Details/L03624>. Accessed June 7, 2017.

⁵¹³ Department of Homeland Security, Office of the Inspector General. 2010. TSA's Preparedness for Mass Transit and Passenger Rail Emergencies. Accessed from https://www.oig.dhs.gov/assets/Mgmt/OIG_10-68_Mar10.pdf. Accessed June 7, 2017.

⁵¹⁴ NFPA 130. National Fire Protection Association's Standard for Fixed Guideway Transit and Passenger Rail Systems. Accessed from <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=130>. Accessed May 1, 2018.

⁵¹⁵ DCMR 12-H

⁵¹⁶ DCR 55.52

⁵¹⁷ DCMR 24

⁵¹⁸ Commonwealth of Virginia. 2014. Virginia Public Water Supply Law. Title 32.1-167-176. Accessed from <http://www.vdh.virginia.gov/content/uploads/sites/14/2016/04/Virginia-Public-Water-Supply-Law-32.1-167-to-176.pdf>. Accessed May 3, 2018.

⁵¹⁹ Code of Virginia 9.1

- Virginia Code, Title 9.1, Commonwealth Public Safety⁵²⁰
- Virginia Uniform State Building Code⁵²¹
- Virginia Statewide Fire Prevention Code⁵²²
- Arlington County Fire Prevention Code⁵²³
- Arlington County Code, Chapter 58, Emergency Management⁵²⁴
- Arlington County Elderly Readiness Implementation Plan⁵²⁵

Relevant State and Local Guidance

- Many state and local safety requirements refer to the NFPA Codes and Standards. The NFPA develops, publishes, and disseminates more than 300 consensus codes and standards intended to eliminate death, injury, property, and economic loss due to fire, electrical, and related hazards. NFPA 130-2010: Standard for Fixed Guideway and Passenger Rail Systems specifies guidance on incorporating passenger safety in system design; egress routes in the event of an emergency; emergency response planning, training, and operations; and fire and smoke prevention and suppression.⁵²⁶

17.3. Study Area

The Project Area includes the tracks, interlockings, bridges, and related railroad infrastructure being modified by the Project. This area runs along the railroad right-of-way, between the RO Interlocking near Long Bridge Park in Arlington, Virginia, and the L'Enfant (LE) Interlocking near 10th Street SW in Washington, DC.

As shown in **Figure 17-1**, the Local Study Area includes the Project Area and 0.5 miles immediately adjacent to the construction footprint. It includes the tracks, interlockings, bridges, and related railroad infrastructure being modified by the Project.

The Regional Study Area for safety and security, which includes service boundaries for fire, law enforcement, and emergency services in the District of Columbia and Arlington, Virginia, is shown in **Figure 17-2**. These service boundaries include specific forces relevant to the Project Area and the District

⁵²⁰ Code of Virginia 9.1

⁵²¹ Commonwealth of Virginia. Virginia Uniform State Building Code. Accessed from <http://www.dhcd.virginia.gov/index.php/va-building-codes/building-and-fire-codes/regulations/uniform-statewide-building-code-usbc.html>. Accessed June 13, 2017.

⁵²² Commonwealth of Virginia. Virginia Statewide Fire Prevention Code. Accessed from <http://www.dhcd.virginia.gov/index.php/va-building-codes/building-and-fire-codes/regulations/statewide-fire-prevention-code-sfpc.html>. Accessed June 13, 2017.

⁵²³ Arlington County Code Chapter 8.1

⁵²⁴ Arlington County Code Chapter 58

⁵²⁵ Arlington County. Elder Readiness Implementation Plan. December 18, 2007. Accessed from <https://arlingtonva.s3.dualstack.us-east-1.amazonaws.com/wp-content/uploads/sites/24/2013/12/Elder-Readiness-Implementation-Plan-2007.pdf>. Accessed May 3, 2018.

⁵²⁶ NFPA 130-2010. Accessed from <http://www.nfpa.org/Assets/files/AboutTheCodes/130/ProposedTIA1080NFPA130.pdf>. Accessed May 3, 2018.

of Columbia, including Amtrak Police, Metropolitan Police, Arlington Police, Metro Transit Police, U.S. Park Police (USPP), and U.S. Capitol Police (USCP). Unless otherwise noted, the Regional Study Area for safety and security covers the District of Columbia and Arlington, Virginia.

17.4. Methodology

Existing emergency services, law enforcement, emergency response plans, and community safety features, such as vehicular safety, railroad, pedestrian and bicycle safety, schools in the Project Area and Local Study Area, and the identification of high-risk facilities, accessibility barriers, and fall hazards in the Project Area were analyzed. Various data sources were considered in developing the impact assessment on security and safety to include:

- National Uniform Crime Reporting (UCR) Program for crime statistics for Local Study Area
- NFPA Codes and Standards, as applicable
- Police and fire mutual aid agreements
- District, Virginia, and Arlington County emergency service and operation plans
- Accident statistics reports and railroad car maintenance reports from Amtrak and FRA
- DHS preparedness information
- Local transit providers (Washington Metropolitan Area Transit Authority [WMATA], Arlington Transit [ART], and District Department of Transportation [DDOT]) emergency and safety plans
- Adopted District, Arlington County, and regional security operating procedures

17.5. Affected Environment

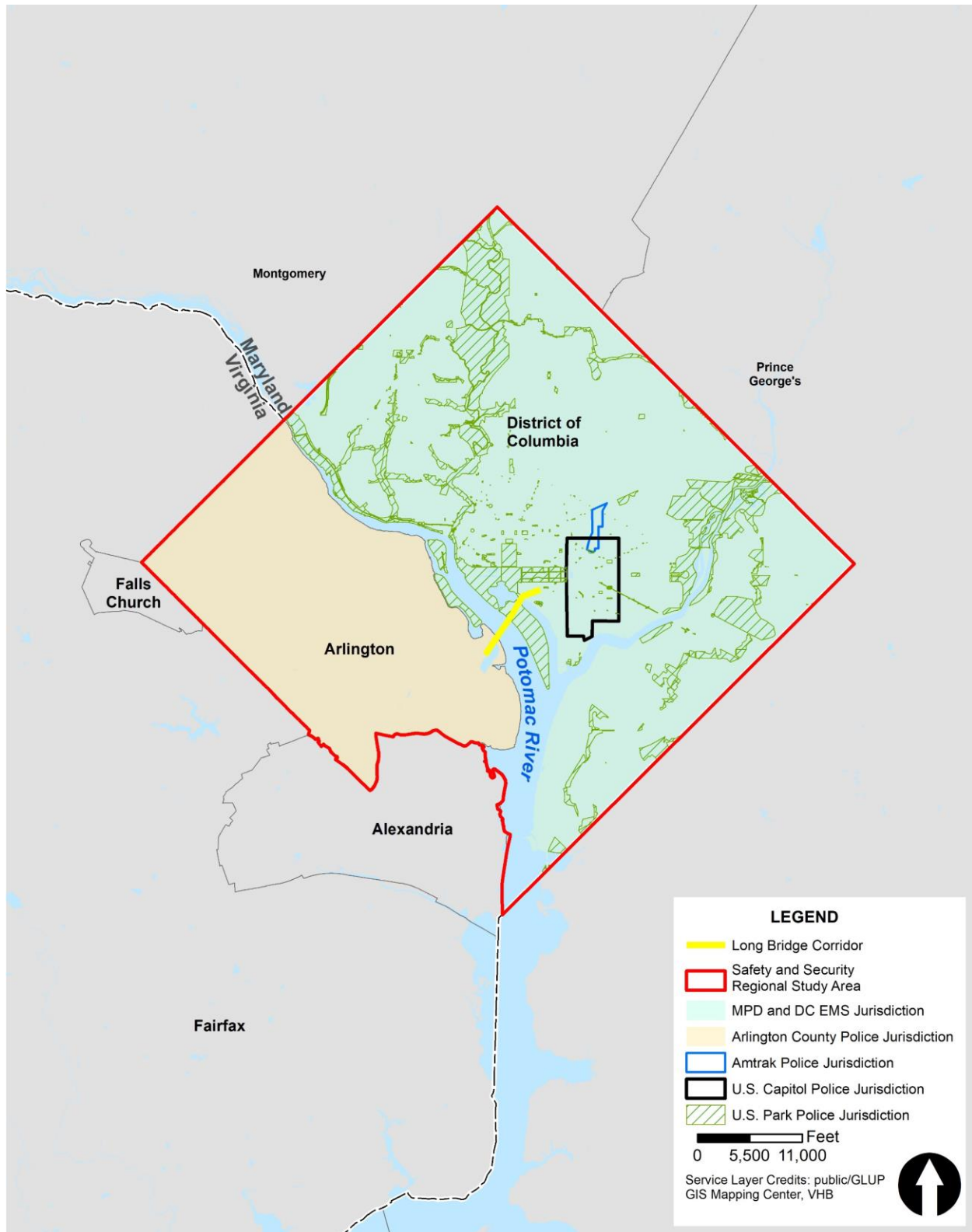
The following data sources have been considered to overlay and establish existing conditions for safety and security:

- National UCR Program for crime statistics for Local Study Area
- NFPA Codes and Standards, as applicable
- Police and fire mutual aid agreements
- District, Virginia, and Arlington County emergency service and operation plans
- Accident statistics reports and railcar maintenance reports from Amtrak and FRA
- DHS preparedness information
- Local transit providers (WMATA, ART, and DDOT) emergency and safety plans
- Adopted District, Arlington County, and regional security operating procedures

Figure 17-1 | Local Study Area for Safety and Security



Figure 17-2 | Regional Study Area for Safety and Security



17.5.1. Railroad Safety

Railroad safety in the Project Area is overseen by the FRA, Amtrak, and CSX Transportation (CSXT). Based on FRA safety data, since Calendar Year 2012, there have been two derailments on CSXT-owned track in the District of Columbia.⁵²⁷ In that same period, there were \$927,086 in reported damages.

According to the Virginia Avenue Tunnel Final Environmental Impact Statement (FEIS), CSXT regularly meets with District first responders regarding freight railroad transportation issues including response procedures, coordination and communications during incident response, and training. CSXT has supported and will continue to support railroad incident training for District first responders. District emergency responders regularly participate in specialized safety training provided by CSXT for emergency planning assistance and response. In 2010, more than 220 District Fire and EMS personnel participated in hands-on training on how to respond to a railroad incident at CSXT's Benning Rail Yard. In addition, CSXT and District emergency responders participate in table-top drills, crisis management exercises, and other coursework designed to meet the needs of the District Fire and EMS. Since 2007, CSXT has sponsored 13 District Fire and EMS hazmat team members to attend a week-long training session at the Association of American Railroads Security and Emergency Response Training Center in Pueblo, Colorado.⁵²⁸

17.5.2. Emergency Response

In the District, the Local Study Area is located within the MPD's First and Second Districts, and encompasses portions of the 105th and 207th Police Service Areas. MPD serves the Local Study Area primarily out of the First District Headquarters at 101 M Street SW and the Second District Headquarters at 3320 Idaho Avenue NW (outside of the Local Study Area). As the Potomac River and other bodies of water within the Local Study Area fall within the District of Columbia, the MPD's Harbor Patrol Unit provides police and rescue services in the Potomac and adjoining waterways. Emergency medical response is provided out of the District's Fire and EMS Department and supplemented by private ambulance firms such as American Medical Response (AMR); the District's EMS system coordinates among these various entities to provide service to local hospitals.

In Arlington, the Local Study Area is located within the Second Police District and encompasses portions of Police Beat 49. The Arlington County Police Department headquarters are located at 1425 N. Courthouse Road, outside of the Local Study Area. Emergency medical response, including ambulance transportation, is provided by the Arlington County Fire Department and coordinated through the Virginia Department of Health Office of Emergency Medical Services.

The USPP and the USCP also have jurisdiction over portions of the Local Study Area in both Virginia and the District, including the National Mall and the George Washington Memorial Parkway (GWMP).

The Local Study Area is served by the District of Columbia Fire Department (DCFD) Fire Boat and Engine Companies 7 and 13. The Fire Boat and Company 7 are part of Battalion 6. Company 13 is part of

⁵²⁷ Due to a lack of granularity in the data, it is unknown how many of these crashes happened in the Project Area.

⁵²⁸ Federal Highway Administration (FHWA) and District Department of Transportation (DDOT). 2014. Virginia Avenue FEIS: Appendix L. Page L-107. Accessed from http://www.virginiaavenuetunnel.com/sites/default/files/Appendix_L_-_Draft_EIS_Comments_Responses.pdf. Accessed January 3, 2018.

Battalion 2. Engine Company 7 is located at 1101 Half Street SW. The Fire Boat is docked on the Southwest Waterfront, at 550 Water Street SW, and responds to waterborne emergencies. Company 13 is located at 400 E Street SW.

17.5.3. Crime

Among the MPD's seven districts, the First District had the highest numbers of total reported crimes and property crimes in 2016. The First District represented the median for reported violent crimes among the seven MPD districts.⁵²⁹ In 2017, eight violent crimes, and 74 total crimes, occurred within the Local Study Area in the First District.

MPD has several ongoing practices and initiatives intended to reduce crime, particularly violent crime, and improve relations and increase cooperation between the police force and community members. Among these are the piloting and subsequent introduction of a full-scale body-worn camera program. MPD also uses a citywide closed-circuit television (CCTV) system, with 144 neighborhood-based cameras across all seven MPD districts, to more efficiently direct and deploy resources. MPD has installed cameras at six locations in the Local Study Area.

MPD places an emphasis on community policing and beat patrols. The department has multiple initiatives intended to counter traditional summer crime trends by putting more officers on the street during summer months.

According to Arlington County data, countywide crime decreased by 2.6 percent. There were 400 violent crimes countywide in 2016.⁵³⁰ In 2017, one violent crime, and nine total crimes, occurred within the Local Study Area in Arlington.⁵³¹

17.5.4. Schools

Schools are considered in this safety analysis because children are a population especially vulnerable to safety issues, including incursion onto the tracks in the Project Area. In the District, schools within the Local Study Area include Apple Tree Early Learning Public Charter School (680 I Street SW), Amidon-Bowen Elementary School (401 I Street SW), Jefferson Middle School (801 7th Street SW), Washington Global Public Charter School (525 School Street SW), and Eagle Academy Public Charter School (475 School Street SW). In Arlington, the only school within the Local Study Area is the Sparkles! Child Care Facility at 1235 South Clark Street.

17.5.5. Security

In preparing the Virginia Avenue Tunnel Environmental Impact Statement (EIS), DDOT and the Federal Highway Administration (FHWA) extensively documented the ongoing procedures related to security in

⁵²⁹ Metropolitan Police Department (MPD). Undated. Crimemap Application. Accessed from <http://crimemap.dc.gov>. Accessed January 8, 2018.

⁵³⁰ Arlington County Police Department. 2016. 2016 Annual Report. Accessed from <https://arlingtonva.s3.dualstack.us-east-1.amazonaws.com/wp-content/uploads/sites/11/2017/01/2016-Annual-Report-FINAL.pdf>. Accessed January 8, 2018.

⁵³¹ Arlington County Police Department. Undated. Community Crime Map. Accessed from <http://communitycrimemap.com/?address=Arlington,VA>. Accessed January 8, 2018.

the Project Area. According to the FEIS, “The CSXT railroad route is managed and monitored by CSXT in conjunction with DHS.”

The safe transportation of hazardous materials is regulated by the FRA. The TSA determines the routes for shipment of certain hazardous materials. CSXT does not transport explosive, toxic by inhalation (TIH), or poisonous by inhalation (PIH) materials through the District. For security reasons, CSXT does not publicly disclose information about the materials it transports; however, CSXT regularly provides a list of the top 25 hazardous materials (by railroad car count) shipped through the District to the District Homeland Security and Emergency Management Agency (HSEMA), and the District Fire and EMS, and Police Departments, as well as DHS. All railroad workers, including CSXT employees and its contractors that work on or near railroad tracks, are required to be formally trained and undergo what is called “Roadway Worker Protection Training” per FRA statutory requirements. In addition, each roadway worker is required to undergo security training. All railroad contractors undergo a criminal background check every 2 years under the requirements of the industry’s e-RAILSAFE program.⁵³²

Incursions onto the tracks are security and operational concerns for railroads generally. Within the District portion of the Project Area, the railroad tracks are generally at a different elevation from roadways and walkways. Along the Maryland Avenue corridor, fencing above barriers prevents incursions into the tracks in some areas. In other areas, there are only high barriers without fences. In the approach to the bridge itself, some areas of the tracks are potentially accessible from National Park Service (NPS) areas, but trees and other greenery provide a barrier. On the Virginia side, the tracks can be accessed from a service road just north of Long Bridge Park. That road does not appear to be blocked by a gate or guard. Individuals could also access the tracks south of the Project Area from the VRE Crystal City station.

Security concerns related to Long Bridge and other critical transportation assets are the subject of a multi-agency planning initiative within the District of Columbia. As the nation’s capital and home to numerous critical functions of the Federal government, the District features a robust security apparatus across a variety of agencies, including MPD, USCP, USPP, and the U.S. Secret Service, among others. The District government includes HSEMA, which coordinates preparedness and response in the event of an emergency. The District and the Federal government have developed multiple contingency plans targeted at securing critical infrastructure and ensuring the safety of citizens should an emergency situation arise.

⁵³² FHWA and DDOT. 2014. Virginia Avenue FEIS: Appendix L. Page L-107. Accessed from http://www.virginiaavenuetunnel.com/sites/default/files/Appendix_L_-_Draft_EIS_Comments_Responses.pdf. Accessed January 3, 2018.

18.0 Environmental Justice

18.1. Overview

Executive Order (EO) 12898 of February 11, 1994: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs Federal agencies to take appropriate and necessary steps to identify and address disproportionately high and adverse environmental effects of Federal agency actions (including transportation projects) on minority and low-income populations.⁵³³

The U.S. Department of Transportation (USDOT) Order to Address Environmental Justice in Minority Populations and Low-Income Populations sets forth the USDOT policy to consider Environmental Justice principles in all USDOT programs, policies, and activities.⁵³⁴ It describes how the objectives of Environmental Justice are integrated into planning and programming, rulemaking, and policy formulation. This Order also requires that any activities that will have a disproportionately high and adverse effect on populations protected by Title VI ("protected populations") will only be carried out if:

- 1) A substantial need for the activity exists, based on the overall public interest; and
- 2) Alternatives that would have less adverse effects on protected populations (and that still satisfy the need identified in item 1 above), either
 - a) Would have other adverse social, economic, environmental or human health impacts that are severe; or
 - b) Would involve increased costs of extraordinary magnitude.

Minority populations, as defined in Federal Transit Administration (FTA) Circular 4703.1 are any readily identifiable group or groups of minority persons who live in geographic proximity and, if circumstances warrant, geographically dispersed or transient persons, such as migrant workers or Native Americans, who will be similarly affected by the proposed project.⁵³⁵ A minority population includes persons who are American Indian or Alaskan Native, Asian American, Native Hawaiian or Other Pacific Islander, African American (not of Hispanic Origin), and Hispanic or Latino. This Environmental Justice analysis also considers minority to include persons identified as being either "some other race" or "two or more races" in the census data.

A low-income person, as defined in FTA Circular 4703.1, is one whose median household income is at or below the Department of Health and Human Services (HHS) poverty guidelines. A low-income population is any readily identifiable group or groups of low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed or transient persons who will be similarly affected by a proposed USDOT program, policy, or activity.

⁵³³ EO 12898

⁵³⁴ USDOT Order 5610.2(a)

⁵³⁵ FTA Circular 4703.1

18.2. Regulatory Context and Guidance

The following laws, regulations, agency jurisdictions, and guidance are pertinent to environmental justice resources. Key regulations and guidance that are most relevant to the Project are listed below.

18.2.1. Environmental Justice Federal Laws, Regulations, and Other Guidance

Relevant Federal Laws, Regulations, and EOs:

- EO 12898 of February 11, 1994: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations⁵³⁶
- EO 12948 of January 30, 1995: Amendment to EO No. 12898⁵³⁷
- Title VI of the Civil Rights Act of 1964⁵³⁸
- USDOT Order 5610.2(a), Actions to Address Environmental Justice in Minority Populations and Low-Income Populations⁵³⁹
- Federal Transit Laws, Public Transportation, 2009⁵⁴⁰

Relevant Federal Guidance:

- Council on Environmental Quality (CEQ), Environmental Justice – Guidance Under the National Environmental Policy Act (December 10, 1997)⁵⁴¹
- U.S. Environmental Protection Agency (EPA), Promising Practices for Environmental Justice Methodologies in NEPA Reviews: *Report of the Federal Interagency Working Group on Environmental Justice and NEPA Committee* (March 2016)⁵⁴²
- USDOT, Environmental Justice Strategy (November 15, 2016)⁵⁴³
- FTA Circulars

⁵³⁶ EO 12898

⁵³⁷ EO 12948

⁵³⁸ Public Law 88-352

⁵³⁹ USDOT Order 5610.2(a)

⁵⁴⁰ 49 USC 53

⁵⁴¹ Council on Environmental Quality. 1997. Environmental Justice Guidance Under the National Environmental Policy Act. Accessed from <https://ceq.doe.gov/nepa-practice/justice.html>. Accessed April 26, 2018.

⁵⁴² Environmental Protection Agency. 2016. EPA Environmental Justice Methodologies in NEPA Reviews: Report of the Federal Interagency Working Group on Environmental Justice and NEPA Committee. Accessed from <https://www.epa.gov/environmentaljustice/ej-iwg-promising-practices-ej-methodologies-nepa-reviews>. Accessed April 26, 2018.

⁵⁴³ USDOT. 2016. Environmental Justice Strategy. Accessed from <https://www.transportation.gov/policy/transportation-policy/environmental-justice-strategy>. Accessed April 26, 2018.

- 4702.1A, Title VI and Title VI-Dependent Guidelines for FTA Recipients⁵⁴⁴
- 4703.1, Environmental Justice Policy Guidance for FTA Recipients⁵⁴⁵

Because FTA is a Cooperating Agency, the environmental justice analysis for the Project must also be consistent with FTA guidance. FTA Circular 4703.1, Environmental Justice Policy Guidance for Federal Transit Administration Recipients (FTA, 2012), provides guidance for incorporating Environmental Justice principles into plans, projects, and activities subject to adoption of or approval by FTA. FTA includes incorporation of Environmental Justice and non-discrimination principles into transportation planning and decision-making processes and project specific environmental reviews.

18.2.2. Environmental Justice State and Local Laws, Regulations, and Other Guidance

Relevant State and Local Laws and Regulations:

- There are no relevant state and local laws and regulations for Environmental Justice.

Relevant State and Local Guidance:

- District Department of Transportation, Environmental Manual, 2nd Edition, Chapter 24 Environmental Justice (June 20, 2012)⁵⁴⁶

18.3. Study Area

The Local Study Area for the Environmental Justice analysis extends beyond the Project Area, and accounts for effects that may be felt outside the area of direct impacts, such as changes in air quality, noise, vibration, and land uses that may adversely or disproportionately affect low-income or minority communities. The Local Study Area for the Environmental Justice analysis includes the Project Area, which spans from the midblock between 9th Street SW and 10th Street SW in the District and Long Bridge Park in Arlington County, Virginia, as well as 0.5 miles immediately adjacent to the Project Area. The U.S. Census blocks and block groups are the smallest geographic units for which the demographic data collected for this analysis are available; therefore, some analyses that rely on U.S. Census information capture data that extends beyond the Local Study Area including the entirety of the blocks or block groups that are located within or intersect the 0.5-mile Local Study Area. **Figure 17-1** shows the Local Study Area. The 0.5-mile radius captures the extent of indirect impacts that may be noticeable. This Local Study Area is designated in such a way as to capture all relevant impacts. A wider Regional Study Area is not necessary for this topic.

⁵⁴⁴ FTA Circular 4702.1B

⁵⁴⁵ FTA Circular 4703.1

⁵⁴⁶ District Department of Transportation. 2012. Environmental Manual, 2nd Edition. Chapter 24: Environmental Justice. Accessed from http://ddotsites.com/documents/environment/Files/Chapters/Chapter_24_-_Environmental_Justice.pdf. Accessed April 26, 2018.

18.4. Methodology

The data source for the identification of minority populations is the Year 2010 Census. Minority populations were quantified at the block level, which is the smallest geographic unit for which race and ethnicity data are available. The U.S. Census takes place every 10 years and is intended to account for every resident in the United States. The Census also collects information on home ownership, sex, age, race, and ethnicity.

The data source for the identification of low-income populations is the American Community Survey (ACS) 5-year average data for 2011–2015. Low-income populations were quantified at the block group level, which is the smallest geographic unit for which low-income population data are available. The ACS is an ongoing survey that provides data on age, sex, race, family and relationships, income and benefits, health insurance, education, veteran status, disabilities, where people work and how they get there, where people live, and how much people pay for essentials. The purpose of the ACS is to provide an annual data set that enables communities, state governments, and Federal programs to plan investments and services. ACS provides periodic estimates that describe the average characteristics of populations and housing over a period of data collection. The ACS is administered continually and, unlike the Census, is a random sampling of people from all counties and county-equivalents in the U.S.

Census and ACS data were used to identify minority and low-income groups in the Study Area using the definitions outlined in **Section 18.1**. Thresholds for the percentage of minority or low-income residents were established based on the percentages of minority and low-income residents in the District of Columbia (the District); Arlington County, Virginia; and the Study Area.

Additional data sources were used to provide more recent indications of low-income populations within the study area. The District's GIS data on affordable housing production and preservation projects (updated November 20, 2017) was used to identify affordable housing in the portion of the Study Area within the District. Affordable housing production and preservation projects in the District are managed by the Department of Housing and Community Development (DHCD), the Deputy Mayor for Planning and Economic Development, the DC Housing Authority, the DC Housing Finance Agency, and the District's Inclusionary Zoning program. For the portion of the Study Area within Virginia, the list of apartment complexes offering affordable housing was geocoded from Arlington County's Affordable Housing website.

The combined use of these data sources provides a comprehensive foundation for assessing the presence of Environmental Justice communities. The original methodologies proposed for this topic outline an exhaustive list of sources for information; however, not all sources were considered necessary to provide an adequate description of the minority and low-income populations within the Study Area.

Figure 18-1 | Study Area for Environmental Justice



18.5. Affected Environment

As noted above, EO 12898 requires Federal agencies to “make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.”

This chapter presents an overview of demographic data (race and ethnicity and poverty status) for the census blocks and block groups within the Study Area to identify the presence of Environmental Justice populations.

18.5.1. Minority Populations

As noted in **Table 18-1** shows that, of the total 18,101 residents in the Study Area in 2015, 10,569, or approximately 58.4 percent, were White. From 2010 to 2015, the White population increased in the District block groups and decreased in the Virginia block groups, with an overall decrease of 173 White residents in the Study Area overall. Black or African Americans made up approximately 16.3 percent of the 2015 Study Area population, a slight increase over the 2010 Black or African American percentage of 15.6 percent. The Black or African American population makes up a more significant portion of the population within the District block groups at 35.9 percent compared with the Virginia block groups at 9.8 percent. The Asian Study Area population increased from 1,892 (10.9 percent of the total population) in 2010 to 2,628 (14.5 percent) in 2015. Conversely, the Hispanic or Latino population decreased by 213 people during that same time period, from 8.2 percent of the Study Area population in 2010 to 6.8 percent in 2015.

Table 18-1 | Race or Ethnicity of Study Area Population

Race or Ethnicity	Washington, DC		Arlington County, VA		Total Study Area	
	2010 (% of Total)	2015 (%)	2010 (%)	2015 (%)	2010 (%)	2015 (%)
White	1,682 (44.3%)	2,111 (47.1%)	9,060 (66.6%)	8,458 (62.1%)	10,742 (61.7%)	10,569 (58.4%)
Black or African American	1,425 (37.5%)	1,609 (35.9%)	1,290 (9.5%)	1,337 (9.8%)	2,715 (15.6%)	2,946 (16.3%)
Hispanic or Latino	252 (6.6%)	255 (5.7%)	1,183 (8.7%)	967 (7.1%)	1,435 (8.2%)	1,222 (6.8%)
Asian	273 (7.2%)	303 (6.8%)	1,619 (11.9%)	2,325 (17.1%)	1,892 (10.9%)	2,628 (14.5%)
American Indian and Alaska Native	11 (0.3%)	0 (0.0%)	40 (0.3%)	32 (0.2%)	51 (0.3%)	32 (0.2%)
Native Hawaiian and Other Pacific Islander	3 (0.1%)	0 (0.0%)	10 (0.1%)	11 (0.1%)	13 (0.1%)	11 (0.1%)
Some other race	12 (0.3%)	8 (0.2%)	29 (0.2%)	0 (0.0%)	41 (0.2%)	8 (0.0%)
Two or more races	142 (3.7%)	195 (4.4%)	376 (2.8%)	490 (3.6%)	518 (3.0%)	685 (3.8%)
Total	3,800	4,481	13,607	13,620	17,407	18,101

Source: 2010 U.S. Census, 2011–2015 ACS 5-Year Estimates

The summary above provides an overview of the populations within the District, Arlington County, and the Study Area at the block group level; for a more detailed review of possible minority populations within the Study Area, the Year 2010 Census data provides these data at a finer scale, census blocks. Therefore, these Year 2010 Census data were evaluated within the Study Area to determine the potential for the presence of environmental justice populations within the Study Area. Using the percent minority in the District from the above summary as a threshold to identify minority populations within the Study Area may underrepresent minority populations in the Study Area, while using the percent minority in Arlington County may over-represent minority populations in the Study Area. Therefore, the Council on Environmental Quality (CEQ) guidance threshold of 50 percent was used as an indicator of minority populations within the Study Area.

As shown in **Figure 18-2** and **Table 18-2**, census blocks within the Study Area had a population of 13,932 in 2010. African Americans make up the largest minority group in the Study Area, at approximately 17 percent. Much of the Study Area is not occupied as housing but instead by places of business, retail, or recreation. The census blocks at the southern portion of the Study Area are populated where the Study Area begins to intersect with Crystal City in Arlington, Virginia. Of the six populated census blocks in Virginia that are included within the Study Area, minority populations range from 0 to 38 percent.

Figure 18-2 | Minority Population in the Study Area



Table 18-2 | Minority Populations in Study Area

Map Number	Geography	Minority Percentage	Total Population
1	Block 5008, Block Group 5, Census Tract 1034.02	0.0%	1
2	Block 2034, Block Group 2, Census Tract 102	9.4%	64
3	Block 1009, Block Group 1, Census Tract 102	10.0%	20
4	Block 1000, Block Group 1, Census Tract 1035.02	16.1%	87
5	Block 2000, Block Group 2, Census Tract 1034.02	17.2%	261
6	Block 1000, Block Group 1, Census Tract 1034.02	17.3%	323
7	Block 2001, Block Group 2, Census Tract 1036.02	19.7%	575
8	Block 5009, Block Group 5, Census Tract 1034.02	22.3%	892
9	Block 4000, Block Group 4, Census Tract 1034.02	25.0%	737
10	Block 1001, Block Group 1, Census Tract 1036.02	25.1%	634
11	Block 2001, Block Group 2, Census Tract 1034.02	25.4%	849
12	Block 1003, Block Group 1, Census Tract 1035.03	27.4%	1586
13	Block 1006, Block Group 1, Census Tract 1034.02	28.9%	90
14	Block 2001, Block Group 2, Census Tract 1035.03	29.0%	1899
15	Block 2023, Block Group 2, Census Tract 102	29.3%	41
16	Block 1004, Block Group 1, Census Tract 1035.02	29.5%	556
17	Block 1008, Block Group 1, Census Tract 1034.02	30.2%	530
18	Block 2000, Block Group 2, Census Tract 1035.03	32.0%	125
19	Block 2040, Block Group 2, Census Tract 102	35.0%	157
20	Block 1001, Block Group 1, Census Tract 1035.03	37.9%	499
21	Block 2000, Block Group 2, Census Tract 1035.02	39.4%	1020
22	Block 1020, Block Group 1, Census Tract 102	41.6%	89
23	Block 2028, Block Group 2, Census Tract 105	42.8%	1005
24	Block 1016, Block Group 1, Census Tract 102	43.3%	90
25	Block 1021, Block Group 1, Census Tract 102	50.0%	440
26	Block 1018, Block Group 1, Census Tract 102	55.7%	131
27	Block 1019, Block Group 1, Census Tract 102	56.5%	177
28	Block 2038, Block Group 2, Census Tract 102	59.0%	607
29	Block 2027, Block Group 2, Census Tract 105	76.8%	436
30	Block 1022, Block Group 1, Census Tract 62.02	100.0%	3
31	Block 1021, Block Group 1, Census Tract 62.02	100.0%	8

Many of the census blocks in the District are occupied by East Potomac Park, West Potomac Park, and the National Mall. There are two census blocks north of the National Mall, approximately 0.5 miles from the railroad lines, that comprise 100 percent minority (in this case, African American) populations. At the southern portion of the Study Area in the District (in the vicinity of the Southwest Waterfront), there

are 12 occupied census blocks. Of these, four include minority populations exceeding 50 percent (ranging 56 to 77 percent).

For census blocks where the minority population was below the threshold (as indicated by data from the Year 2010 Census), the presence of places of worship with predominantly minority congregations was used to determine whether localized Environmental Justice communities exist. While two places of worship exist within the Study Area, neither appear to host predominantly minority congregations.

Based on this analysis, there are several small distinct Environmental Justice communities in the Study Area. All of these minority population communities are in the District. The majority of these communities do not live within the Census blocks immediately adjacent to the Long Bridge Corridor, although they may use park resources within the Local Study Area. Specifically, local District residents use East Potomac Park for activities such as cycling along Ohio Drive, walking on trails, and picnicking along the waterfront.

18.5.2. Low-Income Populations

Low-income populations were identified using HHS poverty guidelines. As set forth in EO 12898, an area is identified as containing a low-income population when the median household income for the area is below the HHS poverty threshold, which was \$24,250 for a family of four in 2015. Because the guidelines are nationwide and median incomes are higher in the District and Northern Virginia than nationally, the percentage of households below 150 percent of the HHS poverty guidelines was also identified for each block group. Using this more conservative measure, approximately 11 percent of the population in the Study Area can be identified as low income. Approximately 13 percent of Arlington County households are below 150 percent of the HHS poverty threshold, and approximately 26 percent of District residents are below this threshold. To identify low-income Environmental Justice populations, a very conservative threshold of 13 percent was used. In other words, block groups with greater than 13 percent of its households below 150 percent of the poverty line exceeds the proportion for Arlington County as a whole, the more affluent of the two counties and cities that intersect the Study Area.

As shown in **Table 18-3** and **Figure 18-3**, the low-income population varies across the Study Area. The concentration of residents below the poverty line varies from a low of 0 percent to a high of approximately 24 percent. Two block groups (105.00-1 and 102.00-1) in the Study Area have a percentage of low-income households (below 150 percent of the poverty line) higher than 13 percent.

Table 18-3 | Low-Income Population in the Study Area

Block Group	Below Poverty Line	Below 150% of Poverty Line
62.02 BG 1	0%	0%
102.00 BG 1	11%	16%
102.00 BG 2	6%	11%
105.00 BG 1	24%	35%
105.00 BG 2	9%	10%
1034.02 BG 5	4%	7%
9801.00 BG 1	0%	0%
9802.00 BG 1	0%	0%

Note: Entries in bold indicate block groups with low-income populations over 13%

Source: U.S. Census Bureau, 2011–2015 American Community Survey 5-Year Estimates

Additionally, the presence of affordable housing was used to determine whether localized Environmental Justice communities exist (**Table 18-4**). **Figure 18-3** also shows the location of affordable housing units. There are three affordable housing sites within the Study Area. All three of these sites are high-end private developments that reserve some units for residents meeting certain income limits, thus qualifying for affordable housing credits. The availability of such housing indicates the presence of Environmental Justice communities in this area.

Table 18-4 | Affordable Housing Units in the Study Area

Label	Site Name	Address	Jurisdiction
1	Riverside Baptist Development	680 I (Eye) Street SW	Washington, DC
2	Lenox Club	401 12 th Street S	Arlington, VA
3	Crystal City Lofts	305 10 th Street S	Arlington, VA

Figure 18-3 | Low-Income Populations and Affordable Housing in the Study Area

