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MARYLAND

I-495 & I-270 Managed Lanes Study

APPENDIX Q
FINAL INDIRECT AND CUMULATIVE EFFECTS TECHNICAL REPORT
June 2022

U.S. Department of Transportation
Federal Highway Administration

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

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ABBREVIATIONS AND ACRONYMS

APE	Area of Potential Effects
ATI	Area of Traffic Influence
BMP	Best Management Practice
CCT	Corridor Cities Transitway
CDP	Census Designated Place
CEQ	Council on Environmental Quality
CLRP	Constrained Long Range Plan
CO	Carbon Monoxide

COMAR	Code of Maryland Regulations
CWA	Clean Water Act
EIS	Environmental Impact Statement
EJ	Environmental Justice
ESA	Endangered Species Act
ETL	Express Toll Lanes
FCA	Forest Conservation Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIDS	Forest Interior Dwelling Species
GIS	Geographic Information Systems
GP	General Purpose
GSSC	Great Seneca Science Corridor
HOT	High-Occupancy Toll
HOV	High-Occupancy Vehicle
HUC	Hydrologic Unit Code
ICE	Indirect and Cumulative Effects
IPaC	Information Planning and Consultation
LSC	Life Sciences Center
LULC	Land Use/Land Cover
MARC	Maryland Area Regional Commuter
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDNR-WHS	Maryland Department of Natural Resources – Wildlife and Heritage Services
MDOT SHA	Maryland Department of Transportation State Highway Administration
MDP	Maryland Department of Planning
MDTA	Maryland Transportation Authority
MHT	Maryland Historical Trust
M-NCPPC	Maryland-National Capital Park and Planning Commission
MSAT	Mobile Source Air Toxics
MWCOG	Metropolitan Washington Council of Governments
NAAQS	National Ambient Air Quality Standards
NCRTPB	National Capital Region Transportation Planning Board
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NWI	National Wetlands Inventory
PFA	Priority Funding Areas
PM	Particulate Matter
PROS	Park, Recreation, and Open Space

RTE	Rare, Threatened and Endangered
TAZ	Traffic Analysis Zone
TIP	Transportation Improvement Plan
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VDCR	Virginia Department of Conservation and Recreation
VDCR-DNH	Virginia Department of Conservation and Recreation Department of Natural Heritage
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDHR	Virginia Department of Historic Resources
VDNR	Virginia Department of Natural Resources
VDWR	Virginia Department of Wildlife Resources
WHS	Wildlife and Heritage Service

1 INTRODUCTION

1.1 Overview

The Federal Highway Administration (FHWA), as the Lead Federal Agency, and the Maryland Department of Transportation State Highway Administration (MDOT SHA), as the Local Project Sponsor, are preparing a Final Environmental Impact Statement (FEIS) in accordance with the National Environmental Policy Act (NEPA) for the I-495 & I-270 Managed Lanes Study (Study). The I-495 & I-270 Managed Lanes Study (Study) is the first environmental study under the broader I-495 & I-270 Public-Private Partnership (P3) Program.

This Final Indirect and Cumulative Effects Technical Report has been prepared to support the FEIS and focuses on the analysis of the Preferred Alternative. The Preferred Alternative, also referred to as Alternative 9 – Phase 1 South, includes building a new American Legion Bridge and delivering two high-occupancy toll (HOT) managed lanes in each direction on I-495 from the George Washington Memorial Parkway in Virginia to west of MD 187 on I-495, and on I-270 from I-495 to north of I-370 and on the I-270 eastern spur from east of MD 187 to I-270. Refer to **Figure 1-1**. This Preferred Alternative was identified after extensive coordination with agencies, the public and stakeholders to respond directly to feedback received on the DEIS to avoid displacements and impacts to significant environmental resources, and to align the NEPA approval with the planned project phased delivery and permitting approach.

The purpose of the Final Indirect and Cumulative Effects Technical Report is to present the existing conditions, an assessment of potential indirect and cumulative impacts of the Preferred Alternative to the human and natural environment and final mitigation, if applicable, for unavoidable impacts. This Final Indirect and Cumulative Effects Technical Report builds upon the analysis in the Draft Indirect and Cumulative Effects Technical Report, DEIS and Supplemental DEIS (SDEIS), and has been prepared to support and inform the FEIS.

1.2 Study Corridors and the Preferred Alternative

In the SDEIS, published on October 1, 2021, FHWA and MDOT SHA identified the Preferred Alternative: Alternative 9 – Phase 1 South to be consistent with the previously determined phased delivery and permitting approach, which focuses on Phase 1 South. As a result, Alternative 9 – Phase 1 South includes the same improvements proposed as part of Alternative 9 in the DEIS but focuses the build improvements within the Phase 1 South limits only. The limits of Phase 1 South are along I-495 from the George Washington Memorial Parkway to west of MD 187 and along I-270 from I-495 to north of I-370 and on the I-270 east and west spurs as shown in **dark blue** in **Figure 1-1**. The improvements include two new HOT managed lanes in each direction along I-495 and I-270 within the Phase 1 South limits. There is no action, or no improvements included at this time on I-495 east of the I-270 east spur to MD 5 (shown in **light blue** in **Figure 1-1**). While the Preferred Alternative does not include improvements to the remaining parts of I-495 within the Study limits, improvements on the remainder of the interstate system may still be needed in the future. Any such improvements would advance separately and would be subject to additional environmental studies and analysis and collaboration with the public, stakeholders and agencies.

The 48-mile corridor Study limits remain unchanged: I-495 from south of the George Washington Memorial Parkway in Fairfax County, Virginia, to west of MD 5 and along I-270 from I-495 to north of I-

370, including the east and west I-270 spurs in Montgomery and Prince George's Counties, Maryland (shown in both dark and light blue in **Figure 1-1**).

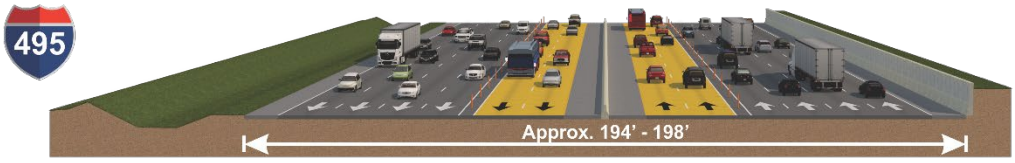
Figure 1-1: I-495 & I-270 Managed Lanes Study Corridors – Preferred Alternative

1.3 Description of the Preferred Alternative

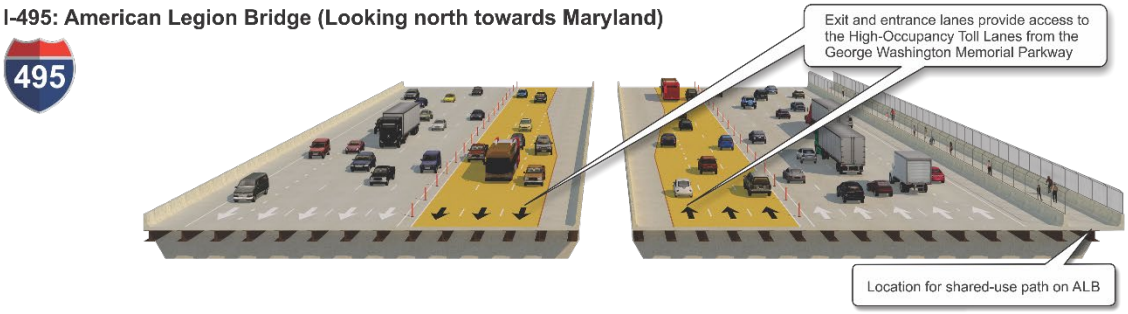
The Preferred Alternative includes a two-lane HOT managed lanes network on I-495 and I-270 within the limits of Phase 1 South only (**Figure 1-2**). On I-495, the Preferred Alternative consists of adding two, new HOT managed lanes in each direction from the George Washington Memorial Parkway to west of MD 187. On I-270, the Preferred Alternative consists of converting the one existing HOV lane in each direction to a HOT managed lane and adding one new HOT managed lane in each direction on I-270 from I-495 to north of I-370 and on the I-270 east and west spurs. There is no action, or no improvements included at this time on I-495 east of the I-270 east spur to MD 5. Along I-270, the existing collector-distributor (C-D) lanes from Montrose Road to I-370 would be removed as part of the proposed improvements. The managed lanes would be separated from the general purpose lanes using pylons placed within a four-foot wide buffer. Transit buses and HOV 3+ vehicles would be permitted to use the managed lanes toll-free.

Figure 1-2: Preferred Alternative Typical Sections (HOT Managed lanes Shown in Yellow)

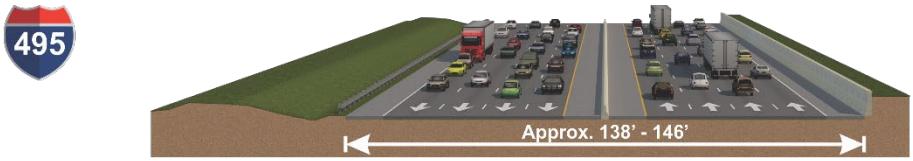
I-495 from the George Washington Memorial Parkway to west of MD 187



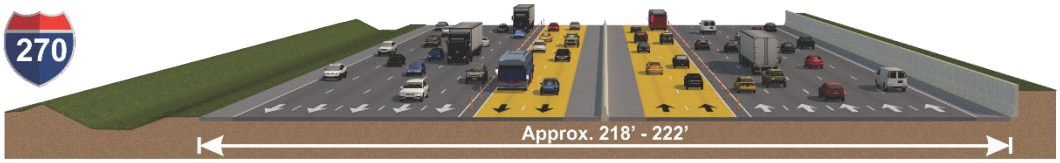
I-495: American Legion Bridge (Looking north towards Maryland)



I-495 west of MD 187 to west of MD 5 - NO ACTION AT THIS TIME



I-270 from I-495 to I-370



2 SCOPING AND METHODOLOGY

2.1 Legislation and Regulatory Guidance

This ICE assessment was conducted in accordance with MDOT SHA's current ICE guidelines (MDOT SHA, 2012) and the guidelines established by MDOT SHA, NEPA, and its implementing CEQ regulations and CEQ ICE Guidance.

The CEQ regulations define indirect and cumulative effects as follows:

Indirect effects are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the patterns of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR § 1508.8).

Cumulative effects are defined as impacts on the environment that result from the incremental impact of the action when added to past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR § 1508.7).

2.2 ICE Analysis Scope and Methodology

The ICE Analysis methodology is described in this section, following these general steps:

- Step 1: Collect data and identify resources (**Section 2.2.1**)
- Step 2: Define the ICE Analysis Boundary (**Section 2.2.2**)
- Step 3: Define the ICE time frame (**Section 2.2.3**)
- Step 4: Define the analysis approach and methodology (**Section 2.2.4**)

This ICE analysis considers the resources, listed below, that could potentially experience direct or indirect impacts by the Preferred Alternative.

2.2.1 Resource Identification and Data Collection

This ICE analysis relies on the following general types of data:

- General population and employment trends based on census and geographic data;
- General growth trends based on reports, historic maps, and aerial imagery;
- Planning and forecasting documents concerning past, present, and future economic development; employment; land use; zoning; transportation; resource protection; and recreation; and
- The history and origins of the proposed action and previous studies undertaken in its development.

The data collection for the ICE analysis focused on the same socioeconomic, natural, and cultural resources evaluated for direct effects and documented in the other technical reports. The ICE scoping analysis initially examined resources that are directly impacted, and also considered whether additional

resources could be indirectly impacted. No additional resources were identified beyond those directly affected.

Existing data was used to prepare maps and tables showing the natural and socioeconomic resources within the ICE Analysis Area, as described below. Data was supplemented with field-verified information, as appropriate. The information includes land use, communities, and reasonably foreseeable development for the Study's ICE time frame. Past and present land uses are quantified, along with reasonably foreseeable developments within the future time frame (discussed below), to identify land use development trends.

2.2.2 ICE Analysis Area Boundary

The environmental resources that could be impacted by the Preferred Alternative were reviewed to identify a geographic boundary for the ICE analysis. The geographic boundary used for the ICE analysis was developed by synthesizing sub-boundaries to create a single ICE Analysis Area boundary. The resources analyzed for ICE and the representative sub-boundaries are listed in **Table 2-1** and further described below.

Table 2-1: Representative Sub-Boundaries for Environmental Resources

Resource	Representative Sub-Boundaries
Socioeconomic Resources	
Communities, residences, businesses, facilities	Area of Traffic Influence (ATI); Census Tracts; Census Designated Places (CDPs), Planning Areas
Parks and Recreation	CDPs, Planning Areas
Cultural Resources	
Historic structures/districts and archeological sites	CDPs, Planning Areas
Natural Resources	
Wetlands and aquatic habitat	Watersheds
Surface water	Watersheds
Floodplains	Watersheds
Forests	Watersheds, CDPs, Planning Areas
Wildlife, Wildlife habitat and sensitive species	CDPs, Planning Areas, Watersheds
Other	
Air Quality	CDPs, Planning Areas, ATI

A. Watersheds

Watershed boundaries from the US Geological Survey (USGS) helped to define the scope of indirect and cumulative effects to forests, surface water, wetlands, aquatic habitat floodplains, wildlife, wildlife habitat, and threatened or endangered species. The study corridors primarily drain to the Potomac River, including portions of the Middle Potomac-Catoctin and Middle Potomac-Anacostia-Occoquan Watersheds, as identified by 8-Digit Hydrologic Unit Codes (HUCs).[1]

[1] Hydrologic Unit Codes (HUC) are used by the US Geological Survey (USGS) to classify watersheds into a hierarchy of hydrologic units. The 12-digit HUCs in the 2013 national Watershed Boundary Dataset were used for the ICE analysis.

Watersheds at the 12-digit HUC were considered in developing the boundary representative of natural environmental resources and potential for indirect and cumulative effects. As shown in **Figure 2-1**, the Study corridor is located within the following 12-Digit HUC watersheds:

- Cabin John Creek
- Lower Rock Creek
- Muddy Branch
- Nichols Run-Potomac River
- Watts Branch

B. Census Tracts

Figure 2-2 shows the 25 US Census Tracts in which the study corridor is located. These 25 Census Tracts have a combined population of 127,861 according to the 2015-2019 US Census American Community Survey 5-Year Estimates. The population of each Census Tract is listed in **Appendix A**. Census Tracts were used rather than Block Groups to account for a larger area and ensure that all potential indirect and cumulative effects are encompassed within the boundary.

C. Planning Areas

Planning area boundaries, established by counties for local-level planning decisions about public facilities, land use, and other factors, were used as an ICE sub-boundary because they encompass public parks, community resources, and important cultural resources in the study corridors. **Table 2-2** lists the Planning Areas within which the study corridors are located, as shown in **Figure 2-3**. These Planning Area Boundaries were considered in the development of the ICE Analysis Area boundary.

Table 2-2: Planning Area Boundaries

County	Planning Area	Map Key (Figure 2-3)
Montgomery	Bethesda/Chevy Chase	1
	Gaithersburg & Vicinity	2
	North Bethesda	3
	Potomac	4
	Rockville	5
Fairfax	Planning Area II	6

Figure 2-1: Watersheds

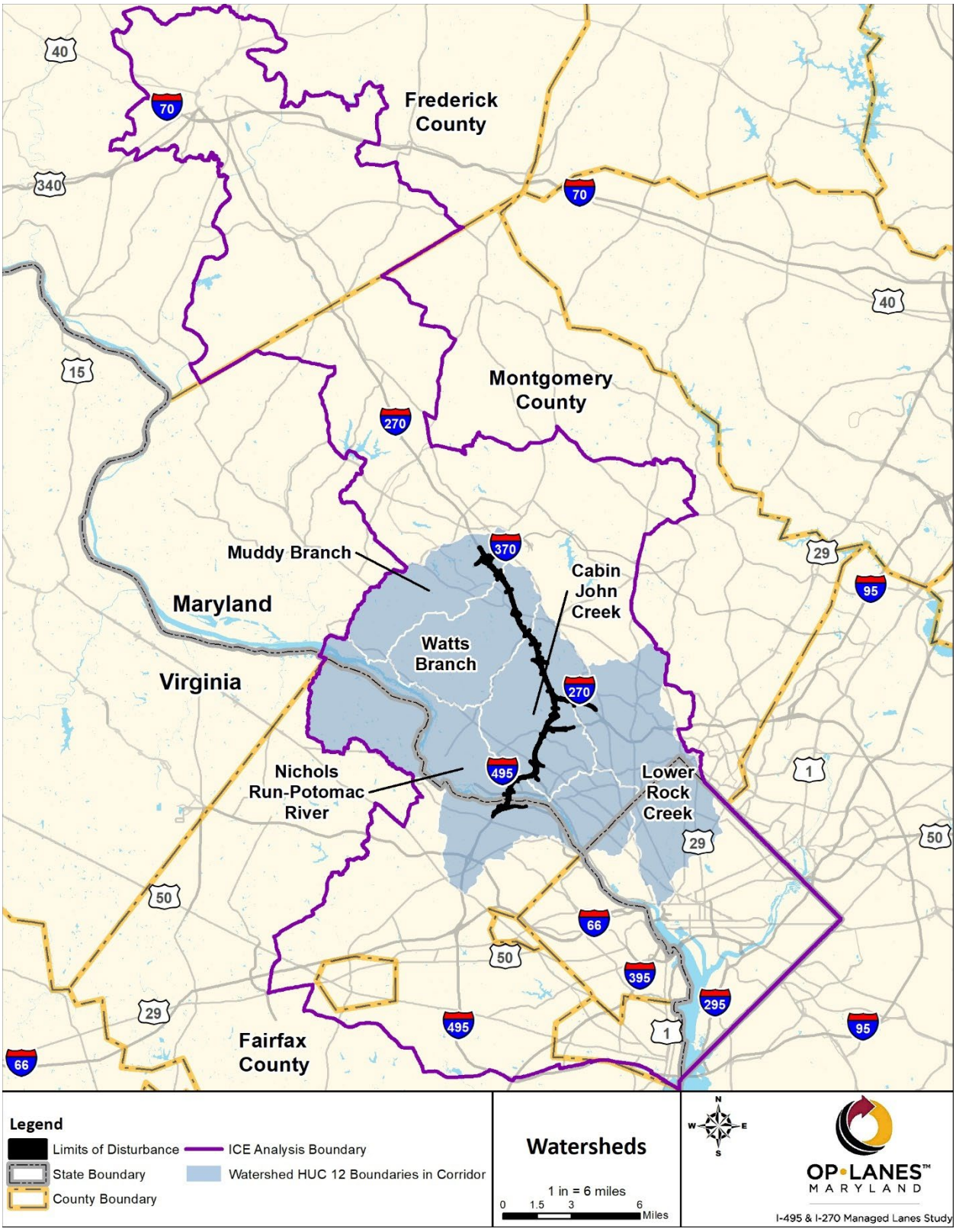


Figure 2-2: Census Tracts

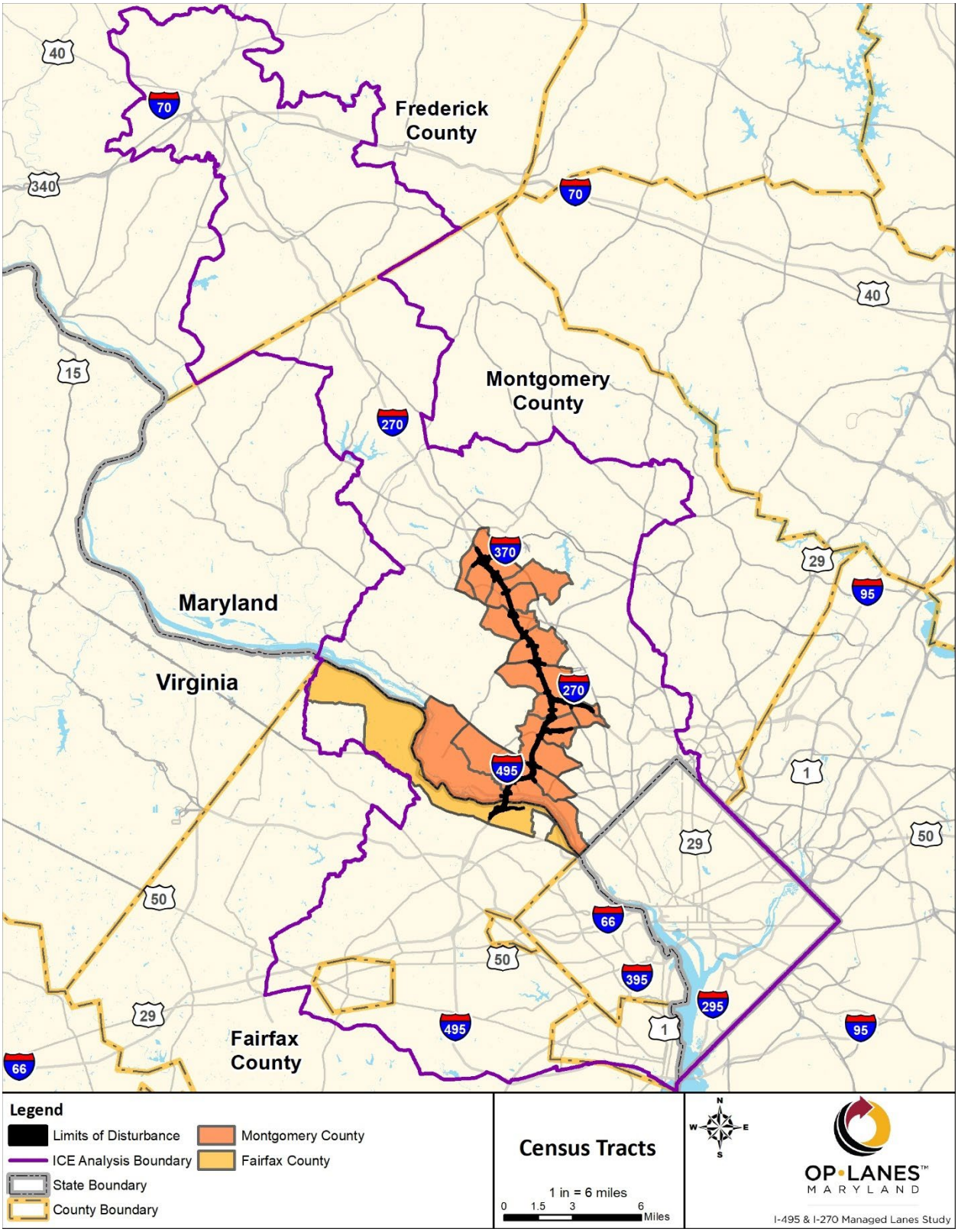
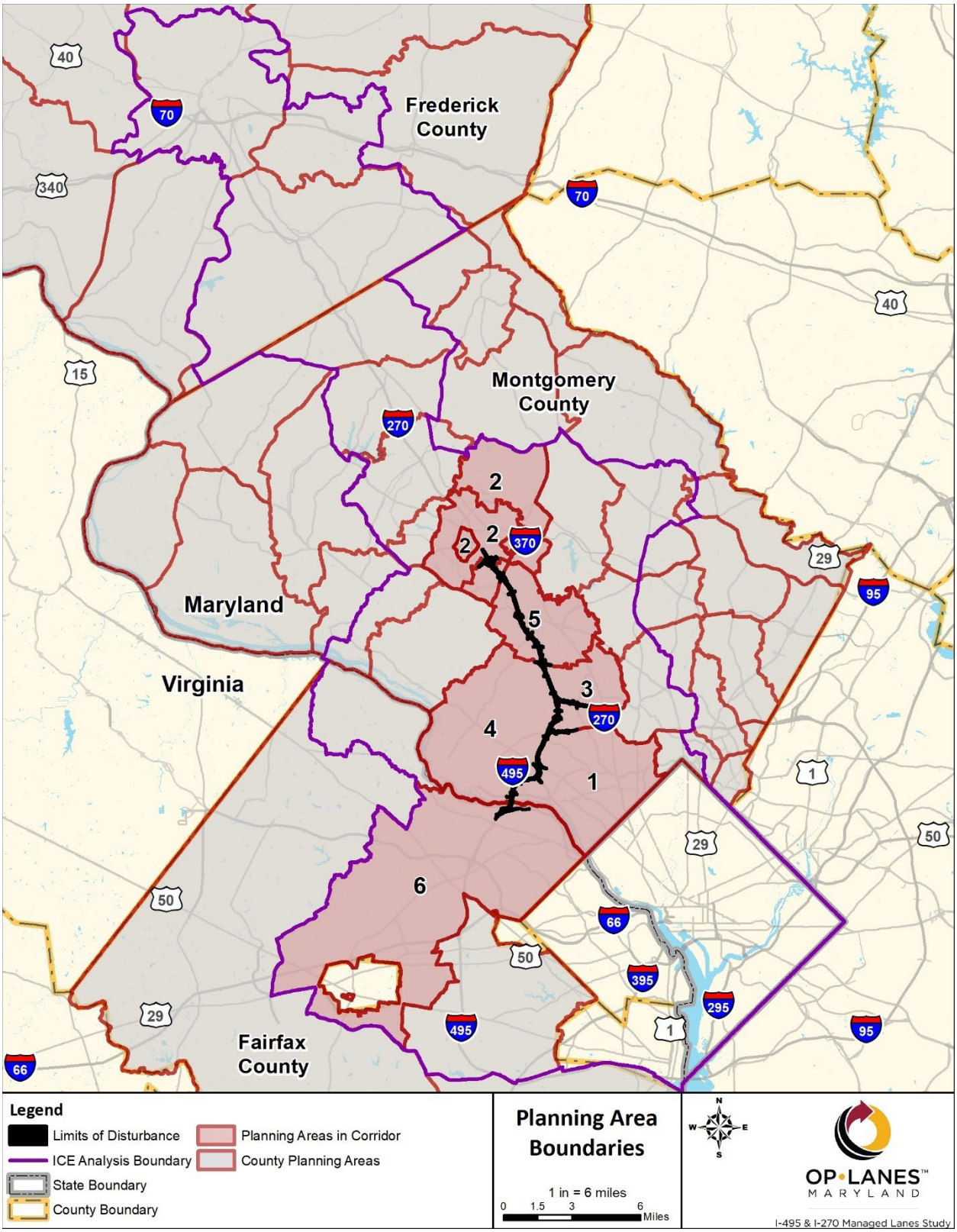


Figure 2-3: Planning Area Boundaries



D. Census Designated Places

CDPs are another way of analyzing concentrations of populations, communities, cultural resources, and community facilities. CDPs, shown in **Figure 2-4**, are statistical delineations of settled concentrations of population. The CDPs were considered in the development of the overall ICE Analysis Area boundary.

The study area corridors are located in the 7 CDPs listed in **Table 2-3,** with corresponding numbered labels on **Figure 2-4**.

Table 2-3: Census Designated Places

CDP	Map No.
Bethesda	1
Cabin John	2
Gaithersburg	3
McLean	4
North Bethesda	5
Potomac	6
Rockville	7

E. Traffic Analysis Zones and Area of Traffic Influence

The Area of Traffic Influence (ATI) is the geographic area within which the roadways are expected to experience a considerable change in traffic volumes due to improvements planned for the Preferred Alternative. The ATI was developed based on the MDOT SHA Statewide Traffic Model. The traffic analysis zones (TAZs) from the MWCOG that encompass these roadway segments are identified as belonging to the ATI and were considered in the development of the overall ICE Analysis Area boundary. The ATI includes two classes: TAZs that have a total estimate of 800 to 2,000 vehicles per day driving through some portion of the study corridor, and those that have a total of 2,000 or more vehicles per day driving through some portion of the study corridor. **Figure 2-5** shows the ATI.

Figure 2-4: Census Designated Places

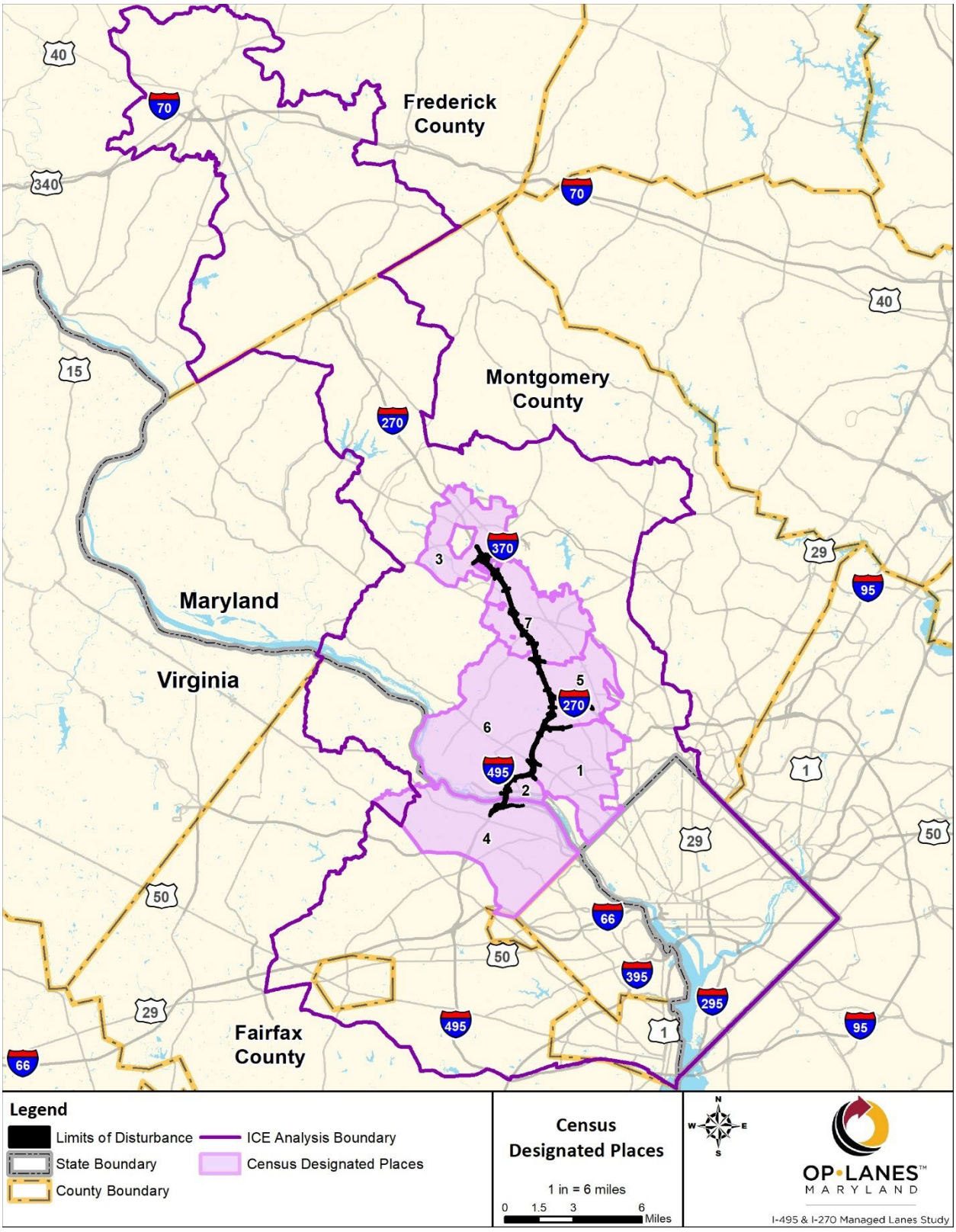
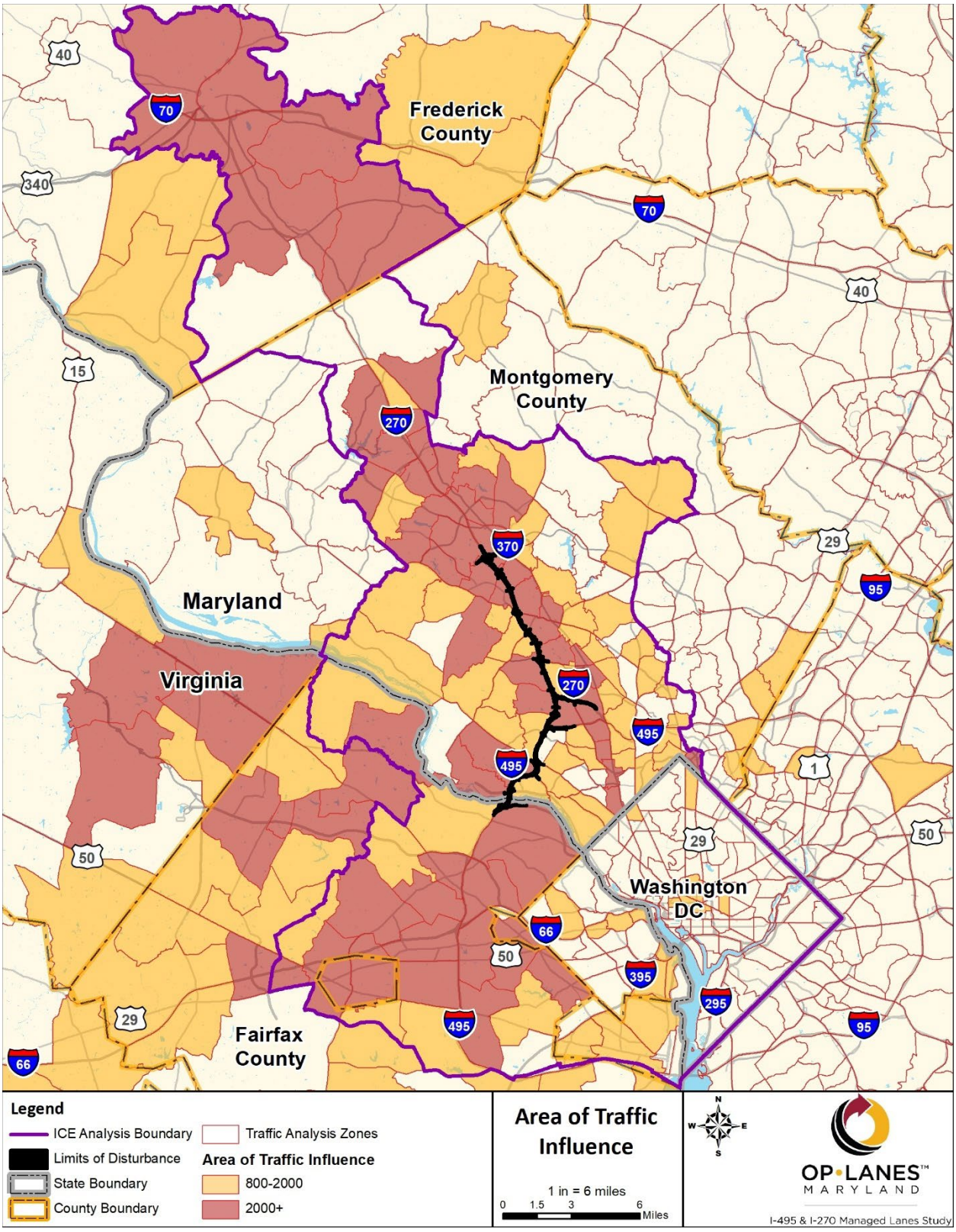


Figure 2-5: Area of Traffic Influence



F. Overall ICE Analysis Area Boundary

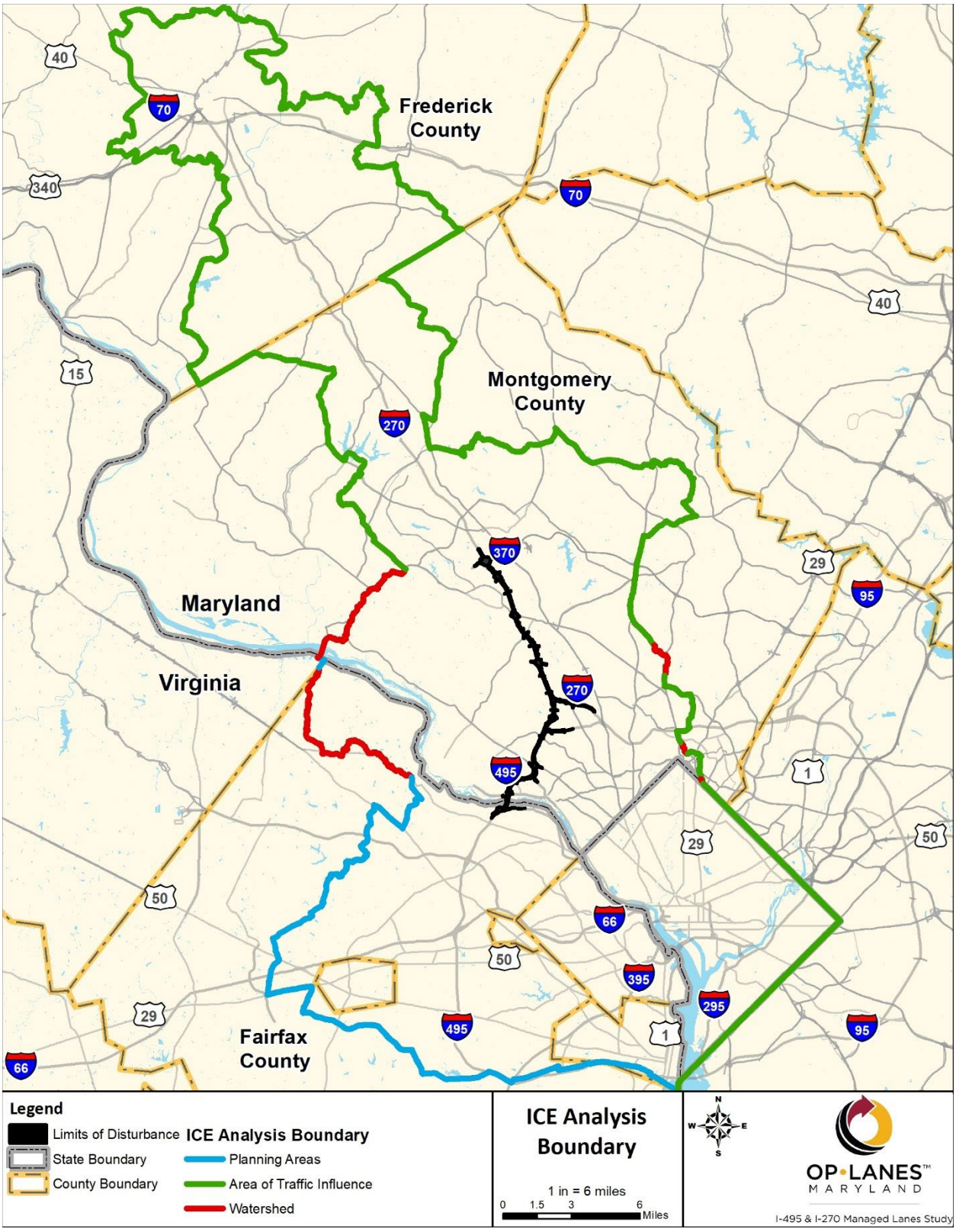
The overall ICE Analysis Area boundary was synthesized using the outermost extents of portions of the sub-boundaries for Planning Areas, 12-Digit HUC Watersheds, and TAZs. CDPs and Census Tracts were generally encompassed within the other sub-boundaries. The boundary was developed to capture the full geographic area where potential indirect and/or cumulative effects are reasonably foreseeable.

The ICE Analysis Area boundaries were established as follows.

- Areas closest to the study corridors were established to follow the outermost edges of either the contiguous portions of the ATI or the 12-digit HUC watershed boundaries (whichever extended the furthest). Portions of the boundary were adjusted to form a less complex and more compact shape where appropriate, following TAZ boundaries.
- Portions of the ICE Analysis Area boundary along I-270 further from the study corridor improvements followed the 2,000 or more vehicle classification portion of the ATI and extended at least one TAZ on either side of I-270. This proposed boundary definition extends to areas in and around I-270 that would most likely experience potential indirect and cumulative effects.
- In the Virginia portion of the ICE Analysis Area, the boundary was drawn to include the HUC-12 watersheds that contain the study corridors (located along the Potomac River). The boundary was also extended to include the planning areas contiguous to I-495 in Fairfax and Alexandria.
- In the DC portion of the ICE Analysis Area, the boundary was drawn to follow the TAZ boundaries along the DC-Maryland border, so as to encompass the District of Columbia.

Figure 2-6 shows the overall ICE Analysis Area boundary, and the sub-boundaries that were used to develop specific portions of the boundary.

Figure 2-6: Overall ICE Analysis Area Boundary



2.2.3 ICE Time Frame

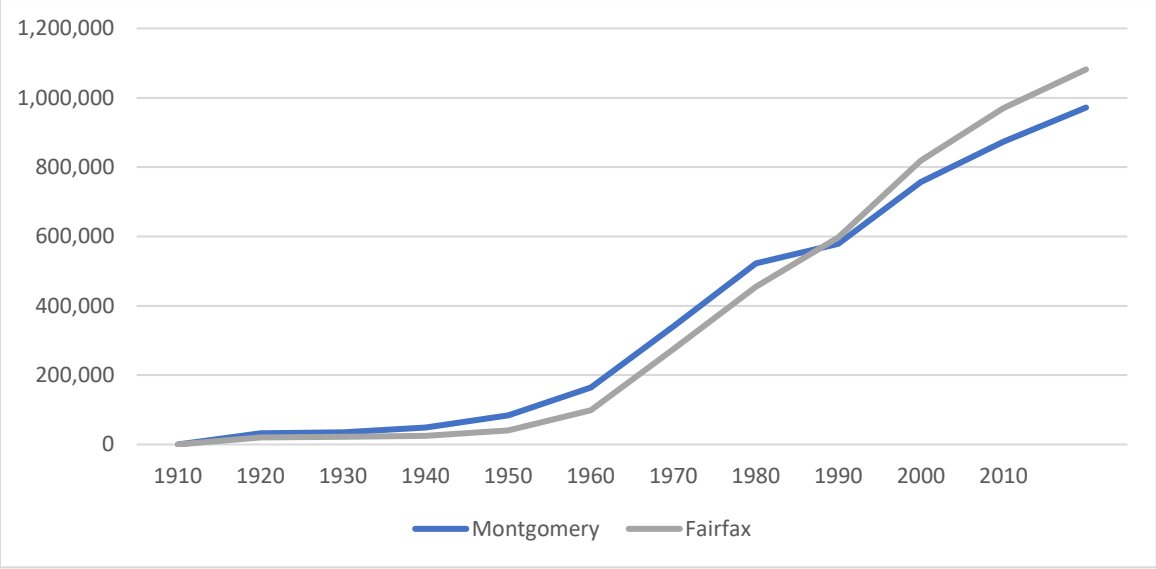
The temporal boundaries, or time frame, of the ICE analysis includes setting a past and future time frame. In general, the temporal boundary is identified based on factors including data availability, relevant historical events or trends, and the design year for improvements being evaluated in the EIS.

A period of 75 years, from 1970 to 2045, is the ICE time frame (or temporal boundary). The first section of I-495 was opened in 1961, and the highway was completed in 1964. Therefore, 1970 is the first year for which decennial census data was available after the completion of I-495. In addition, 1970 generally coincides with the opening of I-95 between Baltimore and Washington, DC. Washington National Pike was built from 1953 to 1960 and became known as I-270 in 1975.

The past time frame also reflects population trends in Montgomery and Fairfax Counties. The counties experienced rapid increases in population between 1930 and 1970. Montgomery County's growth rate peaked at 107 percent between 1950 and 1960. After 1970, the population growth leveled to an average of 17 percent in Montgomery County. Fairfax County followed a similar trend, peaking at 179 percent growth between 1950 and 1960, then leveling off after 1980 (**Figure 2-7**). Additionally, natural and socioeconomic resource information is more limited prior to the passage of NEPA in 1969. In summary, 1970 was selected as the past time frame based on past events, population changes, and availability of data.

The future time frame of 2045 was determined based on the Study's design year, as well as the availability of data. Population and employment projections are available through 2045 from MWCOG, allowing a more accurate depiction of future conditions within the ICE Analysis Area. Based on these projections, all jurisdictions within the ICE Analysis Area are expected to increase in population and employment through 2045. This growth is projected to be concentrated in Washington, DC and along major transportation corridors, including I-495 and I-270. Future population projections are presented in **Table 3-6** and future employment projections are presented in **Table 3-8**.

Figure 2-7: Historic Population Trends in Montgomery and Fairfax Counties



Source: US Census Bureau Decennial Census 1910-2010

2.2.4 ICE Analysis Approach and Methodology

The ICE analysis requires an understanding of past, current and potential future conditions in the study area in order to assess the potential for impacts associated with the Preferred Alternative. Consideration of past effects included research and review of published literature, census information, and historic aerial imagery. Geographic information systems (GIS) mapping was obtained or created for the ICE Analysis Area and used to assess trends from the past to the present time frame. Resources identified within the ICE boundary are considered in light of past and present socioeconomic, cultural, natural environmental and air quality conditions and trends. Future conditions are analyzed to compare build and no build scenarios and the resulting potential indirect and cumulative effects.

The methodologies identified in the MDOT SHA ICE guidance were applied, including trends analysis and overlays.

- Trends analysis involves qualitative discussion of impacts to a resource over time. Past and current effects can allow for an informed projection of likely future effects.
- Overlays of present and future land use maps over the existing environmental resources allow for quantitative or qualitative description of the impacts to those resources.

Based on these methods, the ICE Analysis is designed to identify impacts to resources from other actions (past, present, and future) including indirect impacts—if any—due to the Preferred Alternative. Then, the potential incremental effects of the Preferred Alternative are evaluated in light of the past, present, and future impacts identified. **Table 2-4** provides a brief summary of the resources, data, data sources, and analysis methodology used for identifying potential indirect and cumulative effects.

Table 2-4: Data Sources and Methodology

Resource	Data	Data Sources	Analysis Methodology
Socioeconomic Resources			
Communities (facilities, services, cohesion), residences, businesses, parks and recreation	Aerial photos, land use maps, census data, county comprehensive plans	M-NCPPC, MDP, Maryland iMap GIS, MWCOG, US Census Bureau, Montgomery County, Fairfax County, Alexandria, City of Fairfax	Overlay mapping and aerial photos, analyze trends in population and housing and availability of services, examine county comprehensive plans
Cultural Resources			
Historic structures/districts and archeological sites	Historic maps and photos, land use maps, historical site records	M-NCPPC, MHT, VDHR, National Register	Overlays of land use surrounding historical sites; trend analysis
Natural Resources			
Surface Water / Floodplains	Stream mapping, aerial imagery, land use data, watershed boundaries, floodplain mapping	M-NCPPC, MDNR, MDE, VDEQ, FEMA	Overlays of land use and historical imagery, trends analysis

Resource	Data	Data Sources	Analysis Methodology
Wetlands and Aquatic Habitat	Wetlands mapping, land use and historical imagery	M-NCPPC, MDNR, VDNR, NWI	Overlays of land use and historical imagery, trends analysis
Forests	Land use mapping and historical imagery	M-NCPPC, MDNR, MDP, VDNR	Overlays of land use and historical imagery, trends analysis
Wildlife, Habitat and Sensitive Species	Land use mapping and imagery	M-NCPPC, MDP, VDNR	Overlays of land use and historical imagery, trends analysis
Other			
Air Quality	CLRP	NCRTPB	Regional conformity discussion

A. Socioeconomic Resources

Analysis of indirect and cumulative effects to communities and community facilities considers community services and cohesion, parks and recreational facilities, and planned land uses. Aerial imagery, historic maps, census statistics for tracts and CDPs, land use maps, and land use plans are used as appropriate. Overlays of historic aerial photographs facilitate the analysis of trends in population and housing growth, including qualitative comparisons of facilities over time. County and local comprehensive plans are used to identify future land uses, planned projects, and other relevant information. Data from the Maryland-National Capital Park and Planning Commission (M-NCPPC), the Maryland Department of Planning (MDP), MWCOG, and US Census Bureau are used, as appropriate.

B. Cultural Resources

Historic maps and photos, land use maps, and historical site records are used to evaluate potential indirect and cumulative impacts to historic structures, historic districts, and archeological sites. Data from the M-NCPPC, the Maryland Historical Trust (MHT), the Virginia Department of Historic Resources (VDHR), and the National Register of Historic Places are used.

C. Natural Resources

Evaluation of indirect and cumulative effects to natural resources includes conclusions derived from data from the Maryland Department of Natural Resources (MDNR), Maryland Department of the Environment (MDE), Virginia Department of Environmental Quality (VDEQ), Virginia Department of Natural Resources (VDNR), USGS, US Environmental Protection Agency (USEPA), M-NCPPC, Federal Emergency Management Agency (FEMA), National Wetlands Inventory (NWI), US Army Corps of Engineers (USACE), and the Natural Resources Conservation Service. This evaluation includes surface water and floodplains, wetlands and aquatic habitat, forests, wildlife, wildlife habitat, and sensitive species to identify potential indirect and/or cumulative effects. Trends analysis is used to identify qualitative trends in these resources over time, and land use overlays allow for comparison of these resources relative to changing land uses in the ICE Analysis Area.

D. Air Quality

The ICE Analysis includes a brief, qualitative discussion of potential indirect and cumulative effects to air quality. This includes a summary of the direct impacts to air quality and a discussion of regional air quality conformity planning.

3 INDIRECT AND CUMULATIVE EFFECTS ANALYSIS

3.1 Background Information

3.1.1 Land Use

The ICE Analysis Area covers portions of Montgomery and Frederick Counties in Maryland; Fairfax County, Arlington County, Alexandria,[2] Fairfax, and Falls Church in Virginia; and Washington, DC. Each of these jurisdictions regulates zoning and enacts land use planning documents to guide future land use and related elements. Some jurisdictions are divided into smaller areas for planning purposes.

A. Plans by Jurisdiction

a. Montgomery County

Montgomery County's General Plan was adopted in 1964 and updated most recently in 1993. Another update to the plan began in 2018 and is anticipated to be completed in 2021. The General Plan establishes a comprehensive vision for the County's future, with broad policy guidelines for land use, transportation, conservation, the environment, open space, employment, and housing. An important element of the General Plan is the concept of "wedges and corridors," in which growth is concentrated along the I-270 Corridor, Metrorail Red Line corridors, and the communities closest to Washington, DC (M-NCPPC, 1964). The corridors are separated by wedges of open space, parks, conservation areas, farmland, and low-density neighborhoods.

Overall land use objectives in the General Plan, as refined in 1993, include, among others, to direct the major portion of Montgomery County's future growth to the Urban Ring and I-270 Corridor, especially to transit station locales. The plan also calls for preserving farmland and rural open space, providing for moderate density residentially-based suburban communities, and providing a coordinated and comprehensive system of parks, recreation, and open space (M-NCPPC, 1993).

Transportation goals in the plan include, among others, developing an interconnected transportation system that provides choices in the modes and routes of travel, improving the efficiency of the existing and planned transportation system by managing its supply and demand, and providing a transit system in appropriate areas of the County that is a viable alternative to single-occupant vehicle travel. The plan also calls for reducing traffic delays on the road system without eroding the quality of life in surrounding communities, unless alternatives to the single-occupant vehicle are available. (M-NCPPC, 1993).

More detailed land use recommendations are found in area master plans. A master plan conveys land use policy for a defined geographic area and sets a vision for the future with specific recommendations. Each community within Montgomery County has a master plan that creates a comprehensive view of land use trends and future development. Even more detailed guidelines may be put forth in sector plans or minor master plans, which cover small portions of a master plan area.

Table 3-1 includes a brief summary of each of the master plans for the planning areas within the ICE Analysis Area. The summary focuses primarily on the land use goals and main objectives of each master plan.

[2] Alexandria, Fairfax, and Falls Church are independent cities in Virginia with jurisdiction equivalent to counties.

Table 3-1: Montgomery County Master Plans Within the ICE Analysis Area

Plan	Year	Plan Highlights
Aspen Hill Master Plan	1994	• Plan area is largely built-out residential, with commercial centers dispersed throughout, a large employment area near the center and no industrial areas. • Plan goals include maintaining existing land use patterns and promoting the suburban residential character of Aspen Hill area, with supporting commercial uses.
Bethesda – Chevy Chase Master Plan	1990	• Plan area includes well established residential neighborhoods, a combination of open space and wooded areas, employment and shopping opportunities, and a high level of transportation service. Recommends supporting the existing residential character and zoning. • Plan recommends a moderate level of development, in balance with the overall transportation capacity. Recommends moderate level of highway improvements.
Boyds Master Plan	1985	• The plan intends to address the need for an orderly and well-balanced growth policy that will enhance the livability of the area and is sensitive to the community's charm and rural nature. • Plan recommends continuation of the existing rural, residential community in accordance with the "wedges and corridors" concept of the General Plan.
Clarksburg Master Plan	1994	• Envisions a transit and pedestrian-oriented community surrounded by open space. • Support for employment growth adjacent to I-270 corridor, and future widening of I-270. Recommends residential growth east and west of I-270.
Damascus Master Plan	2006	• Damascus is a small town surrounded by agricultural and open spaces. It includes community-oriented commercial uses, a variety of housing types, and a mixed-use Town Center surrounded by single-family residential areas. • Plan provides for a moderate amount of planned growth in the area, oriented primarily in and adjoining the Town Center. Seeks to protect open spaces by clustering new development.
Gaithersburg City Master Plan	2009	• Envisions growth concentrated in existing population and business centers, growth areas adjacent to these centers, or strategically selected new centers. Emphasizes compact, mixed-use walkable design compatible with existing character. • Calls for a range of housing densities and types to provide options for residential use. Encourages efficient multimodal transportation and coordination of appropriate design for state and county infrastructure projects.
Germantown Master Plan	1989	• Recommends changes to previous 1974 Master Plan to emphasize environmental issues, encourage detached dwelling units in the mix of housing, and increase densities near transit stations. • Encourages research and development facilities and corporate office development in the Employment Corridor along I-270. Concentrates retail activities in the Town Center, Regional Shopping Mall, and Village Centers to discourage strip development along major roadways.

Plan	Year	Plan Highlights
Kemp Mill Master Plan	2001	• Emphasizes the existing walkability, green spaces, and stable neighborhoods with a varied housing stock in Kemp Mill. The plan aims to reinforce the unique character of Kemp Mill neighborhoods and recognizes that a neighborhood commercial center should serve as a focal point or center for the surrounding neighborhoods. • The plan also provides recommendations aimed at enhancing existing neighborhoods and ensuring that development is controlled through compatibility between zoning and existing land uses.
Master Plan for the Communities of Kensington-Wheaton	1989	• The plan recommends that the predominantly low-to medium-density residential character of the area be maintained and protected. • Recommends development and promotion of modes of transportation other than the single-occupant automobile to facilitate peak-hour commuting.
Montgomery Village Master Plan	2016	• The plan's vision is to preserve the character of the Village, maintain public recreation and open spaces, encourage reinvestment with revitalized retail centers and a mix of uses, and enhance connectivity and multimodal links.
North Bethesda / Garrett Park Master Plan	1992	• Plan recommends that future development be focused at Metrorail stops, new transit stations, and areas best served by transportation infrastructure, with more emphasis on housing. • Acknowledges deteriorated suburban traffic conditions due to rapid growth, with recognition that land use and physical design characteristics of suburban workplaces have directly contributed to the decline in suburban mobility by inducing most employees to drive alone to work.
Olney Master Plan	2005	• The plan proposes a slight increase in the level of planned growth of housing units, and retail and commercial use. The plan also calls for increased protection of forested land as parkland to protect the area's sensitive environmental resources. • Recommends a network of regional and local transportation facilities to ensure that future land use will be adequately served without affecting existing communities and the area's environmental resources.
Potomac Subregion Master Plan	2002	• The plan recognizes Potomac's evolution from a rural and agricultural to a semi-rural and suburban subregion. It strongly recommends that sustaining the environment be the pre-eminent policy, and acknowledges that, "Inexorable population growth continues to foster intense development pressure on the Potomac Subregion." • Recommends maintaining and reaffirming low-density residential land use and maintaining a two-lane road policy that limits road capacity expansion.
Upper Rock Creek Area Master Plan	2004	• A primary goal of the plan is to protect environmental resources and maintain stream quality by keeping streams, forests, and wetlands in a natural state. It also places equal emphasis on preserving residential character. • The generally low-density nature of the Upper Rock Creek watershed is in keeping with the "wedges and corridors" concept outlined in the Montgomery County General Plan.

Plan	Year	Plan Highlights
Rockville Comprehensive Master Plan	2021	• Underlying principles of the plan include promoting attractive, welcoming, and amenity-rich neighborhoods, encouraging a variety of housing types, supporting integrated multi-modal transportation choices, and steering the densest development to mixed-used, transit-served locations. • Recommends retaining existing land uses while acknowledging the need to be forward-looking to accommodate future redevelopment opportunities, maintain a high quality of life, and meet growing demand for walkable and bikeable neighborhoods, as well as intensification of development near transit.
East Silver Spring Master Plan	2000	• The plan recognizes the residential nature of the area and the community orientation of its local commercial centers, and its recommendations are designed to sustain and enhance residential neighborhoods. • The plan recommends a neighborhood-friendly circulation system that accommodates local and regional traffic, while providing pedestrian, bicycle, and auto access to transit, recreation, and shops.
North and West Silver Spring Master Plan	2000	• North and West Silver Spring are composed primarily of established residential neighborhoods supported by local commercial centers. The planning area includes some light industrial, service, and institutional uses. • The plan's recommendations are designed to sustain and enhance these neighborhoods with upgraded infrastructure, stabilized and reused historic resources, renovated parks, and a neighborhood-friendly transportation system that provides pedestrian, bicycle, and vehicular access to Metrorail, recreation, and retail areas.
Takoma Park Master Plan	2000	• The plan's recommendations are designed to sustain and enhance residential neighborhoods. It also makes recommendations to sustain and revitalize viable commercial centers without negatively impacting the surrounding neighborhoods.
Great Seneca Science Corridor (GSSC) Master Plan	2010	• The GSSC Master Plan envisions a science and medical hub known as the Life Sciences Center (LSC). It is concerned with protecting residential neighborhoods and investments made by businesses and institutions in the area – growth and change in the LSC must occur in a way that does not overburden the surrounding communities. • Aligns the Corridor Cities Transitway (CCT) through the LSC and provides four transit stations that will be the focal point of new development. It concentrates density, building height, and civic green spaces at the CCT stations.
Veirs Mill Corridor Master Plan	2019	• The plan seeks to improve connectivity between transit and community uses/facilities, enhance safety for all users of Veirs Mill Road, establish Veirs Mill Road as a multimodal complete street, support the existing residential scale and character, and introduce limited opportunities for redevelopment to strengthen existing neighborhood centers. • Recommends the preservation of existing residential neighborhoods, enhancements to existing commercial centers, and infrastructure to support transit and increased walkability.

Montgomery Planning, 2021, https://montgomeryplanning.org/planning/master-plan-list/

The master plans within Montgomery County are intended to achieve a range of different goals unique to the specific communities to which they apply. Many of these areas are largely built-out, with matured land uses that are predominantly residential. Thus, many plans focused on strengthening and maintaining the character of existing residential areas and community-oriented retail and commercial uses. The plans also support the overall "wedges and corridors" concept of the General Plan as applied to the localized master plan areas. Common themes from the master plans are listed below.

- Maintaining and enhancing the character and functioning of existing residential communities, while allowing for managed growth, supporting diversity of housing stock, and promoting affordable housing.
- Smart Growth principles of clustered development, transit accessibility, and environmental conservation.
- Supporting community-oriented commercial retail centers that are concentrated in designated areas.
- Support for local roadway improvements, intersection improvements, streetscape enhancements, and pedestrian and bicycle infrastructure upgrades.
- Encouraging the increased availability and use of mass transit for commuters.
- Support for protecting open space and sensitive environmental resources, in accordance with the "wedges and corridors" concept of the General Plan.

In addition to the Master Plans above, the ICE Analysis Area includes several Sector Plans and Minor Master Plans, listed below (Montgomery Planning, 2021a).

- Aspen Hill Minor Master Plan
- Bethesda Downtown Sector Plan
- Chevy Chase Lake Sector Plan
- Capitol View and Vicinity Sector Plan
- Forest Glen Sector Plan
- Forest Glen/Montgomery Hills Sector Plan
- Four Corners Sector Plan
- Friendship Heights Sector Plan
- Germantown Employment Area Sector Plan
- Germantown Plan for the Town Sector Zone
- Glenmont Sector Plan
- Glenmont Transit Impact Area and Vicinity Sector Plan
- Greater Lyttonsville Sector Plan
- Grosvenor-Strathmore Metro Area Minor Master Plan
- Kensington Sector Plan
- Rock Spring Sector Plan
- Shady Grove Minor Master Plan
- Silver Spring Central Business District Sector Plan
- Twinbrook Sector Plan
- Westbard Sector Plan
- Wheaton Central Business District and Vicinity Sector Plan
- White Flint Sector Plan
- White Flint 2 Sector Plan

b. Frederick County

The Frederick County Comprehensive Plan was adopted in 2010. The plan notes that Frederick County has experienced numerous changes and transitions during the past 50 years that have taken the County from its predominantly rural, small town, agricultural roots to a suburbanizing bedroom community, and to a maturing county with an established employment base and a prominent community in the City of Frederick (Frederick County, 2010). It states that the County will have opportunities to accommodate and

focus growth in a manner that maintains rural areas and strengthens communities. Notable land use goals from the plan are summarized below.

- Develop a consensus with municipalities to determine how much new residential growth is desired in municipality-centered Community Growth Areas.
- Ensure that adequate infrastructure is provided – concurrently with development – in order to accommodate long-term land use plans.
- Reduce non-rural development outside of Community Growth Areas while maintaining opportunities for compatible agricultural support services and uses in the Rural Communities.
- Manage land use planning and development in a manner that is compatible with the conservation, protection, and enhancement of the County's Green Infrastructure.
- Increase the proportion and density of new residential development occurring within Community Growth Areas while minimizing new development outside.

The Plan also calls for enhancing the quality of the transportation system to assure an acceptable level of service, safety, and travel conditions for roadway users, as well as reducing the need for single-occupancy auto use through travel demand management, transit service, bicycling, and walking. Travel demand management is proposed as an alternative mitigation strategy to the expansion of roadway capacity.

c. Fairfax County

The ICE Analysis Area includes Fairfax County Planning Areas I and II. In addition to the countywide Comprehensive Plan for Fairfax County, there are four plans within Area I, which include Annandale, Baileys, Jefferson, and Lincolnia, and three plans within Area II, which include Fairfax, McLean, and Vienna (Fairfax County, 2017). **Table 3-2** provides a brief summary of each.

Table 3-2: Fairfax County Comprehensive Plan

Plan	Year	Plan Highlights
Comprehensive Plan for Fairfax County	2017	• Includes land use policy objectives, such as establishing areas of community focus with a mixture of compatible land uses, increasing transportation efficiency, encouraging transit use and decreasing automobile use. • Policy to protect, enhance, and maintain stability of established residential neighborhoods.
Fairfax County Comprehensive Plan – Annandale Planning District	2017	• The district is predominantly characterized by single-family detached housing and includes the Annandale Community Business Center (CBC), the Ravensworth Industrial Area, and a portion of the Beltway South Industrial Area. • Main objectives include preserving stable residential areas and emphasizing infill development, encouraging revitalization and selected redevelopment of the Annandale CBC, and ensuring compatibility of infill uses within the Industrial Areas.

Plan	Year	Plan Highlights
Fairfax County Comprehensive Plan – Baileys Planning District	2017	• The district contains two community business centers (CBCs), Seven Corners and Baileys Crossroads, as well as single-family residential neighborhoods and a large component of multifamily housing units. • Main objectives involve preserving stable residential areas with compatible infill development, limiting commercial encroachment into residential neighborhoods, encouraging revitalization and selected redevelopment of the CBCs into mixed-use areas, and improving pedestrian access to and from retail areas.
Fairfax County Comprehensive Plan – Jefferson Planning District	2017	• The district is primarily characterized by stable single-family residential neighborhoods with sizable multifamily residential units, and contains the Merrifield Suburban Center, the Dunn Loring Transit Station Area, and portions of the Tysons Urban Center and Seven Corners Community Business Center. • Major objectives include preserving stable residential neighborhoods, concentrating commercial activity and higher density residential units in the Merrifield Suburban Center, and providing improved pedestrian and vehicular access.
Fairfax County Comprehensive Plan – Lincolnia Planning District	2017	• Lincolnia is one of the older, more developed parts of Fairfax County and is characterized primarily by single-family detached residential development; the district contains the Lincolnia Community Business Center and a portion of the Beltway South Industrial Area. • Planning objectives include preserving stable residential areas with compatible infill development, limiting commercial encroachment into residential neighborhoods, encouraging pedestrian-oriented mixed-use development within the Lincolnia Community Business Center, and improving pedestrian access to retail and services.
Fairfax County Comprehensive Plan – Fairfax Planning District	2017	• The predominant character of the Fairfax Planning District is low-density residential development. • Main objectives include preserving stable residential areas, limiting commercial encroachment into residential neighborhoods, improving pedestrian access, and ensuring compatibility of any future expansion of major institutional uses.
Fairfax County Comprehensive Plan – McLean Planning District	2017	• The district contains the McLean Community Business Center, the West Falls Church Transit Station Area, and a portion of the Tysons Urban Center surrounded by predominantly low-density residential neighborhoods. • Major objectives include balancing growth with internal and external traffic demands, ensuring that development is at a compatible scale, providing improved access to West Falls Church, and containing commercial and higher density uses within the established urban areas.
Fairfax County Comprehensive Plan – Vienna	2017	• The district is predominantly comprised of single-family neighborhoods with the exception of the Vienna Transit Station Area, Merrifield Suburban Center, and the Tysons Urban Center.

Plan	Year	Plan Highlights
Planning District		• Major objectives include providing compatible infill development that maintains the stability of established residential neighborhoods, achieving appropriate development in the Vienna Transit Station Area and Merrifield Suburban Center, and preserving the environment.

d. City of Fairfax

The 2019 City of Fairfax Comprehensive Plan notes that Fairfax is unique due to its close-knit community and its access and proximity to large-city amenities (City of Fairfax, 2019). The City is facing internal and external challenges that put pressure on its identity and future, relating to housing and building stock, economic competitiveness, a strained transportation network, and other regional issues. In order to balance changing needs while maintaining its character, the City is always evolving. The guiding principles of the Plan include having a close-knit and diverse community, inviting neighborhoods with unique character, a choice of housing types, commercial corridors and mixed-use activity centers, and multimodal transportation options.

e. Arlington County

The purpose of the Arlington County Comprehensive Plan identifies a series of overarching principles, summarized below (Arlington County, 2016).

- Retention of the predominantly residential character of the County, and limitation of intense development to defined areas.
- Promotion of commercial and industrial activities in designated areas appropriately related to residential neighborhoods.
- Development of facilities which will promote efficiency in the areas of health, welfare, culture, and recreation.
- Provision of effective water, sewage, and storm water management.
- Provision of an adequate system of traffic routes designed to form an integral part of the regional transportation system, and assuring a safe convenient flow of traffic.

f. City of Alexandria

The citywide portion of Alexandria's 1992 Master Plan lays out a series of land use goals, including preserving the predominant character of Alexandria as a city of residential neighborhoods with a mix of uses, preserving and enhancing residential neighborhoods and historic aspects of the City, preserving residential and commercial diversity, and preserving and increasing parkland and open space throughout the City (City of Alexandria, 1992).

The 2008 Comprehensive Transportation Master Plan for Alexandria encourages the use of alternative modes of transportation, reducing dependence on the private automobile. It calls for the establishment of transit-oriented, pedestrian friendly village centers, focused on neighborhood preservation and increased community cohesion (City of Alexandria, 2008).

g. Falls Church

The City of Falls Church's Comprehensive Plan was adopted in 2017. The plan includes a series of core values including small town character in an urban setting, economic sustainability, environmental sustainability, inclusiveness and social sustainability, education, mobility and accessibility, public health and safety, and responsiveness and accountable governance (City of Falls Church, 2017).

h. Washington, DC

The Land Use Element of the Comprehensive Plan for Washington, DC, which was amended in 2021, is described as the "cornerstone" of the plan. It establishes the basic policies guiding the physical form of the District, and provides direction on a range of development, preservation, and land-use compatibility issues (District of Columbia Office of Planning, 2021). The critical issues facing the District of Columbia addressed in the Land Use Element include:

- Providing adequate housing, particularly affordable housing.
- Conserving, creating, and maintaining inclusive neighborhoods, while allowing new growth that fosters equity, including racial equity, and accessibility.
- Strengthening downtown.
- Enhancing neighborhood commercial districts and centers.
- Balancing competing demands for finite land resources.
- Directing growth and new development to achieve economic vitality and creating jobs while minimizing adverse impacts on residential areas and open spaces.
- Promoting transit-accessible, sustainable development.
- Improving resilience.
- Siting challenging land uses.

The plan goes on to state:

> *"Although Washington, DC was almost fully developed by 1960, the demand for land, housing, and jobs has continued to fuel land use change. The changing needs of the federal government, private industry, and other institutions continually reshape the landscape. Aging, environmentally inefficient, and underused housing stock requires refurbishment and replacement. The renewed popularity of urban living generates the need for more housing and new amenities."*

i. Land Use Plans – Conclusions

The ICE Analysis Area includes portions of numerous planning jurisdictions that have established a wide range of planning documents. These documents consider past and present conditions to develop visions, goals and strategies for future land uses. As such, they are integral to understanding the trends and patterns of development and change throughout the ICE Analysis Area. The following discussions of past, present, and future land uses are based on the information presented in these plans, along with quantified data and mapping on past and present land uses where available.

B. Past and Present Land Use

Because of the broad nature of the ICE Analysis Area, different data sets are available from the various jurisdictions throughout the area. The available information varies in notable ways such as, the level of detail, classification scheme, time frame, and format. Therefore, the discussion below corresponds with the availability of data for the various jurisdictions included in this ICE analysis.

a. Maryland Portion of the ICE Analysis Area

For the Maryland portion of the ICE Analysis Area, Land Use/Land Cover (LULC) is available for 1973, 2002, and 2010 data years from the MDP. As shown in **Table 3-3**, in 1973, forest and agriculture were the most prevalent LULC categories present throughout the area, at approximately 29 percent and 39 percent, respectively. Residential was the third most prevalent land use, at 21 percent. By 2002, the proportion of residential land use had risen to 39 percent, while forest and agricultural land dropped to 26 percent and 19 percent, respectively. This trend continued through 2010, with residential at 42 percent, forested land at 24 percent, and agricultural at 17 percent. The conversion of agricultural land is particularly notable, with a decline of approximately 56 percent between 1973 and 2010.

The data suggests an overall pattern of agricultural and forest land converted into residential use between 1973 and 2010. Institutional and industrial uses rose modestly in this time frame, and other land use categories were generally stable. This substantial increase in residential land use coincides with the growing population in the ICE Analysis Area as described below in **Section 3.1.2**.

Table 3-3: Past and Present Land Use/Land Cover in the Maryland Portion of the ICE Analysis Area[3]

Land Use / Land Cover	1973	2002	2010
Commercial	8,379 (4%)	9,400 (4%)	9,458 (4%)
Industrial	147 (<1%)	4,609 (2%)	4,782 (2%)
Agricultural	86,458 (39%)	41,996 (19%)	36,842 (17%)
Forest	65,342 (29%)	58,111 (26%)	52,936 (24%)
Institutional	5,728 (3%)	9,368 (4%)	10,693 (5%)
Other (Extractive, Open Urban Land, Barren Land)	7,662 (3%)	9,765 (4%)	75,73 (3%)
Residential	46,335 (21%)	85,948 (39%)	94,699 (42%)
Water	3,015 (1%)	3,859 (2%)	3,849 (2%)
Wetlands	0 (0%)	10 (2%)	10 (<1%)
Transportation	N/A	0 (0%)	2,224 (1%)

Source: Maryland Department of Planning, 1973, 2002, 2010 Land Use/Land Cover via Maryland iMap GIS

Land use in the Maryland portion of the ICE Analysis Area is predominantly suburban, mid to low-density residential use, with more dense areas closer to Washington, DC and becoming less intense further from the city core. Commercial, industrial, and institutional uses are generally clustered around major transportation corridors, especially interstate highways. Green spaces are generally stream valley corridors and larger parks dispersed throughout the area.

[3] There have been minor adjustments to the LULC data in this time - in particular, transportation was not included as a category in 1973. However, the data is still broadly comparable for identifying major land use trends over this time frame.

The land uses are notably different in northern Montgomery County, generally north of Germantown along I-270, and Frederick County, where much more rural and agricultural uses predominate. Several large, forested areas are also located near the border between Montgomery and Frederick Counties such as Sugarloaf Mountain Park and Little Bennett Regional Park. Additional residential, institutional, and other areas are clustered around Frederick near the northern extent of the ICE Analysis Area.

b. District of Columbia

Table 3-4 provides land use data for the District of Columbia from 2005, as presented in the District of Columbia Comprehensive Plan. The 2021 amended Land Use Element does not present a detailed breakdown of existing land use and data is not readily available. The District of Columbia Existing Land Use Map, 2017 is included in **Appendix B** of this technical report to provide a visual representation of more recent land use in DC.

Table 3-4: 2005 Land Use in the District of Columbia

2005 Land Use	Acreage	Percentage
Road rights-of-way	10,018	26%
Residential	11,068	28%
Commercial	1,795	5%
Industrial	418	1%
Institutional, Public and Federal Facilities	6,234	16%
Permanent Open Space	7,980	20%
Rail, Utilities	857	2%
Vacant	843	2%

District of Columbia Office of Planning, 2010

The comprehensive plan notes the expansive city core of about four-square miles centered on the open spaces of federal Washington, DC. The core is surrounded by an inner ring of moderate- to high-density residential and mixed-use neighborhoods. Beyond the inner ring is an outer ring of less dense development, characterized largely by single-family housing and garden apartments. The two rings generally correspond to historic development patterns, with most of the inner ring developed by 1920 and the outer ring developed after 1920. No historical land use GIS data is readily available for the District of Columbia. However, as noted in the Comprehensive Plan, the District was almost fully developed by 1960.

The impact of the City's transportation network on land use is apparent in the existing land use map, included in **Appendix B**. Today, most commercial and high-density development beyond the core is centered around radial avenues such as Connecticut Avenue NW and Pennsylvania Avenue SE. Much of the City's industrial development follows railroad corridors from Union Station east along New York Avenue and north to Silver Spring. Additionally, Metrorail stations serve as robust activity centers. The existing land use map also highlights open space networks along Rock Creek and the Potomac and Anacostia Rivers; large institutional uses that include colleges, universities, hospitals, and seminaries; and federal enclaves beyond the core.

The amended plan notes that the City's total land use consists of around 27% road rights-of-way, 10% federal facilities and institutional uses, less than 5% commercial use, and less than 1% industrial use. Aside

from a decrease in federal and institutional uses, these percentages are generally consistent with the 2005 land use data presented in **Table 3-4**.

c. Virginia

The Virginia portion of the ICE Analysis Area is generally characterized by mature suburban residential land uses, with commercial and other uses focused in hubs along major transportation corridors. The land uses are denser in the areas closer to Washington, DC, becoming more suburban further away from the urban core. The Virginia portion of the ICE Analysis Area has seen a major growth in office buildings since 1970, particularly in areas close to highways, Metrorail stations, and near Washington, DC.

Residential land use accounts for 63 percent of the land use in the Fairfax County portion of the ICE Analysis Area. The majority of this (58 percent of the total area) is low-density residential. Institutional use accounts for 7 percent, recreation accounts for 10 percent, and other accounts for 14 percent. Agricultural use accounts for less than one percent. This reflects the area's composition of mostly developed primarily suburban land uses (**Table 3-5**).

Table 3-5: 2021 Land Use in the Fairfax County Portion of the ICE Analysis Area

Land Use	Acres	Percentage
Agricultural	32	<1%
Commercial	3,304	5%
Residential	45,436	63%
Industrial	794	1%
Institutional	4,826	7%
Recreation	7,456	10%
Other (Open Land, Public, Utilities)	9,754	14%

Fairfax County has also seen substantial growth in commercial land uses and denser residential use. As noted in the Fairfax County Comprehensive Plan (Fairfax County, 2017):

> *"Between 1970 and 1995, the number of acres in nonresidential land uses, excluding public facilities, quadrupled, expanding by 463 percent. At the same time, the number of acres in residential land use in the county grew by 168 percent. While single-family detached housing continued to be the predominant land use, the combined development of townhouses and apartments out paced single-family detached housing since 1970 at a rate of 6 to 4 and since 1990, out paced single-family dwelling units at a rate of 2 to 1."*

The portions of the ICE Analysis Area in Fairfax County have experienced growth in residential land uses since 1970, as reflected in the substantial population growth detailed in **Section 3.1.2**, below. Past land use data is not available in the same level of detail as in Maryland and thus cannot be as easily quantified. However, the available information suggests this area has likely followed a trajectory similar to the suburban Maryland portions of the ICE Analysis Area, wherein agricultural and forest land has been converted to suburban residential land uses.

Aerial imagery of Arlington indicates similar prevalence of residential uses, but with higher densities of residential, office, and institutional uses in areas closer to Washington, DC. The Arlington General Land Use Plan states that since the 1970s, the Rosslyn-Ballston and Jefferson Davis Metro corridors have been

targeted for high-density development. The highest density land uses are focused within walking distance of Metro stations, with densities, heights, and uses tapered down to existing single-family residential neighborhoods further away. The Columbia Pike corridor has been a focus of commercial development in Arlington since the 1980s.

Alexandria is primarily residential with concentrations of higher density residential, commercial, and institutional uses focused along the Potomac River and near major transportation facilities. According to Alexandria's comprehensive plan, in 1990 the City was comprised of 50 percent residential land use, 10 percent commercial, 15 percent industrial, 11 percent institutional, 7 percent parks, and 6 percent vacant land. The plan notes that commercial land use nearly doubled between 1974 and 1990, mostly from growth in office buildings. During the early part of this period, most of the large office buildings were built in or adjacent to the Central Business District or along Eisenhower Avenue. More recently large office buildings and multi-building office parks have been developed near the Metrorail stations, in close proximity to I-395 highway interchanges, or on the north waterfront near the National Airport and the District of Columbia.

C. Future Land Use

The availability and level of detail for future land use varies depending on the planning jurisdiction. Background information on future land use is summarized below based on available plans and data by jurisdiction.

a. Montgomery County

The zoning designations in Montgomery County, which are reflective of planned future land uses, primarily focus on commercial, institutional, and industrial uses along the I-270 Corridor, with residential areas surrounding to the east and west. Northern portions of the county, including areas along I-270 within the ICE Analysis Area, are largely designated for agricultural and rural use.

A review of the various land use plans in Montgomery County, as described in **Table 3-1** above, indicates that the comprehensive planning documents aim to protect existing suburban residential areas along I-495, and maintain them in their current form. New growth is to be primarily focused into hubs around existing mass transit, and in more densely urbanized areas closer to Washington, DC. Minimal farmland remains in Montgomery County to be converted; much of the remaining undeveloped land is in the system of preserved parks that was originally envisioned in the "Wedges and Corridors" concept. Therefore, future land use change will most likely take the form of infill development and densification.

b. Frederick County

Frederick County's 2010 Comprehensive Plan aims to focus new development in designated Community Growth Areas, which include Municipal Growth Areas and Unincorporated Growth Areas (Frederick County, 2010). The Community Growth Areas are primarily located in the vicinity of Frederick and along major highways including I-270 and I-70. Community Growth Areas in the ICE Analysis Area include Middletown, Frederick, Frederick Southeast, Ballenger Creek, Urbana, and Monrovia.

Outside of the Community Growth Areas, the areas within the ICE Analysis Area are designated for agricultural and rural uses, or as green infrastructure. Agricultural and rural designations are intended to

emphasize the importance of agriculture and the rural character of the County. The Green Infrastructure areas include the County's network of natural resources and protected lands.

In summary, the comprehensive plan policy is to direct future land use growth in the vicinity of existing population centers and highway infrastructure, particularly near Frederick and along I-270 in the ICE Analysis Area. Additionally, the plan aims to preserve the existing character of agricultural, rural, and green infrastructure areas outside of these locations.

c. Virginia

Fairfax County is largely built-out, and the comprehensive plan aims to protect and strengthen existing residential land uses and manage pressure for future growth (Fairfax County, 2017). The Plan states:

> *"As land values increase due to decreasing supply, the pressure to redevelop existing lower density, as well as nonresidential acreage, will increase […] While in selected instances this may be desirable, the practice of redevelopment must be carefully controlled so as to not undermine stable neighborhoods and provision of public services and facilities."*

The plan also calls for the creation of community-focused mixed-use centers with a compatible mix of housing, commercial, institutional/public services, and recreation uses. These are encouraged within the established urban centers such as Tysons Corner, primarily located along major highways in the County, and focused mostly closer to Arlington and Washington, DC.

Arlington's comprehensive plan calls for retention of the predominantly residential character of the County, and limitation of intense development to defined areas (Arlington County, 2016). In particular, it calls for concentrating high-density development within the Rosslyn-Ballston and Jefferson Davis Metrorail Transit Corridors. It calls for promoting mixed-use development in Metro Station areas, increasing the supply of housing by encouraging construction of a variety of housing types and prices at a range of heights and densities in and near Metro Station Areas, and preserving and enhancing neighborhoods and neighborhood retail areas. Therefore, future land uses will likely be similar to existing but with densification and infill redevelopment, particularly focused around Metro stations.

Alexandria is largely built out; the 1992 Land Use Master Plan for Alexandria notes that there were 1,100 acres of vacant and redevelopable land in the City (City of Alexandria, 1992). The plan also calls for more mixed-use development and maintaining existing residential areas. Future land uses in Alexandria will likely be similar to existing, with mixed-use infill and densification in targeted growth areas around major transportation facilities.

d. District of Columbia

The District of Columbia comprehensive plan notes that Washington, DC has been largely built-out since the 1960s, but demand for land, housing, and jobs has continued to fuel land use change (DC Office of Planning, 2021). Changing needs of the federal government, private industry, and other institutions shape the City's landscape. The City's aging, environmentally inefficient, and underused building stock requires refurbishment and replacement, and the renewed popularity of urban living generates the need for more housing and amenities. The plan states that between 2005 and 2025, approximately 30 percent of DC's housing growth and 70 percent of its job growth occurred, and will have occurred, within the District's

urban core and adjacent close-in areas along the Anacostia River. After 2025, growth is anticipated to occur throughout Washington, DC, including outside of the urban core.

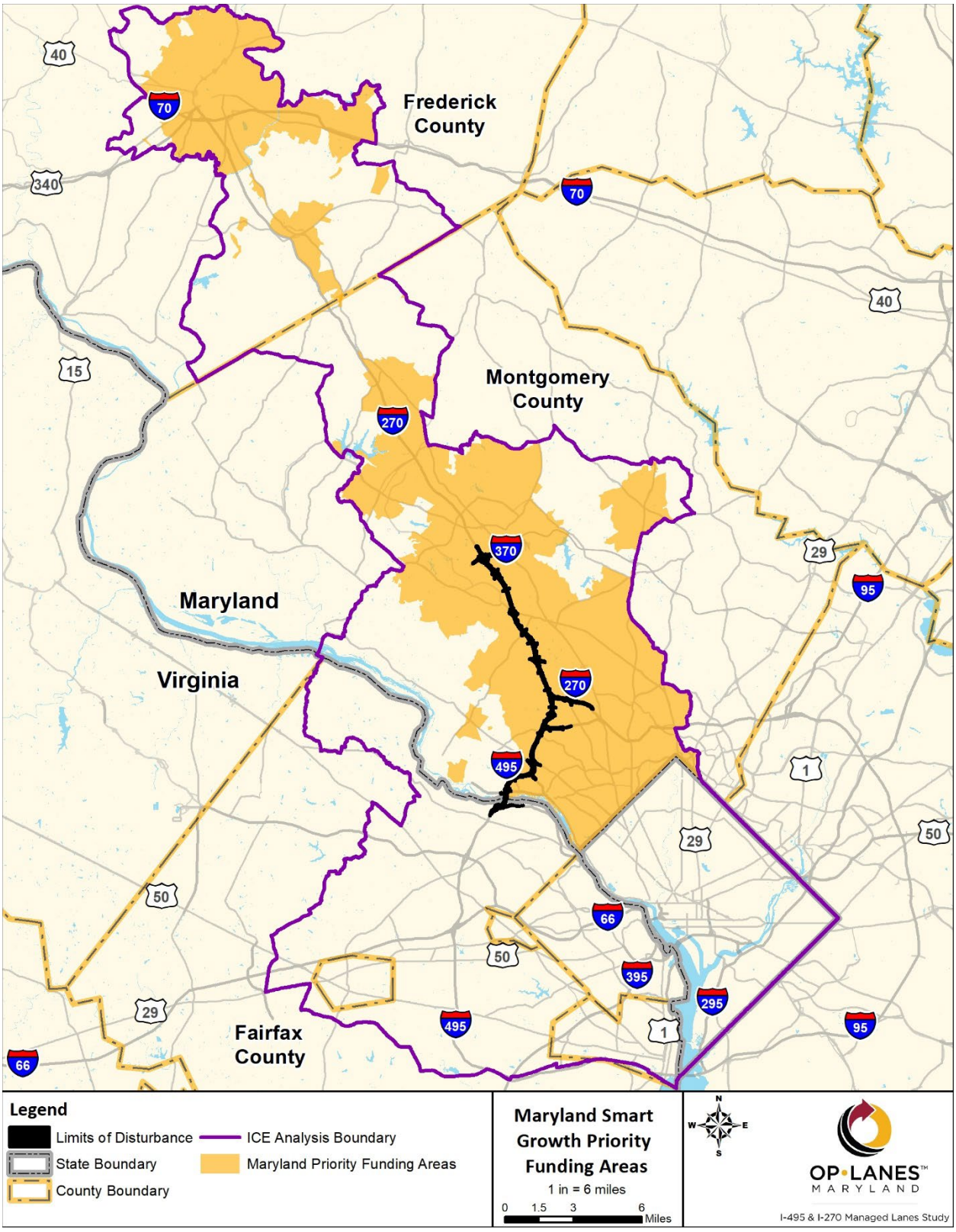
The plan notes that two areas have accommodated much of the central District's recent growth. The first includes land in the triangle bounded by New York Avenue, Massachusetts Avenue NW, and the CSX railroad, along with adjacent lands around the New York Avenue Metro station. The second includes the South Capitol corridor and Near Southeast, including the Capitol Riverfront area. Whereas much of Central Washington was redeveloped for single-purpose office use during the second half of the 20th century, these two areas have experienced recent development with a focus on walkable and mixed-use environments, including housing, employment, and recreation, with an emphasis on alternative modes of transportation. As the urban core expands, reinvestment in established business districts, such as Golden Triangle, the Downtown Core, and Near Southwest will continue, as these areas become modernized, better connected, and developed with new infill and public improvements. Areas outside of the traditional downtown, such as Florida Avenue Market and Rhode Island Avenue NE, provide opportunities for revitalization, while smaller sites represent opportunities for new retail, housing, and office development.

D. Smart Growth

Maryland's *Smart Growth Priority Funding Areas Act of 1997* (Smart Growth Act) directs Maryland state infrastructure funds to areas within or connecting with county-designated and state-certified Priority Funding Areas (PFAs). Growth-related projects include most State programs that encourage growth and development such as highways, sewer and water construction, economic development assistance, and State leases or construction of new office facilities. The Smart Growth Act legislatively designated certain areas as PFAs and established criteria for locally designated PFAs. Through Smart Growth, Maryland is committed to limiting sprawl development by directing funds where they can help to revitalize older neighborhoods, and redirect growth to already developed areas, saving the state's farmland, open spaces, and natural resources. Smart Growth makes efficient use of land, water, and air; creates a sense of community and place; expands transportation, employment, and housing choices; distributes the costs and benefits of development in an equitable manner; and promotes public health (MDP, 2019).

As shown in **Figure 3-1**, the Preferred Alternative is located entirely within PFAs. PFAs cover much of the Montgomery County portion of the ICE Analysis Area, extending north from the Washington DC border and along the I-495 and I-270 corridors. While PFAs are not located where undeveloped farmland remains near the boundary between Montgomery and Frederick Counties, the Frederick County portion of the ICE Analysis Area contains PFAs that are located along I-270 and around the City of Frederick.

Figure 3-1: Maryland Smart Growth Priority Funding Areas



Source: Maryland Department of Planning, http://mdpgis.mdp.state.md.us/pfa/

3.1.2 Population, Housing and Employment

Population data presented in **Table 3-6** was collected for the County-level jurisdictions in the ICE Analysis Area from the US Census Bureau Decennial Census (1970-2010) and American Community Survey 5-Year estimates (2015-2019). Future population projections (2020-2045) are from MWCOG Round 9.1a Cooperative Forecasting.

Table 3-6: Population 1970-2045

Year	1970	1980	1990	2000	2010	2019	2020	2030	2040	2045
Montgomery County, MD	522,809	579,053	757,027	873,341	971,777	1,043,530	1,052,000	1,128,800	1,197,100	1,223,300
Frederick County, MD	84,927	114,792	150,208	195,277	233,385	251,422	267,800	303,600	332,200	341,100
Fairfax County, VA	455,021	596,901	818,584	969,749	1,081,726	1,145,862	1,161,800	1,271,200	1,373,700	1,416,800
Arlington County, VA	174,284	152,599	170,936	189,453	207,627	233,464	238,300	261,800	287,600	301,200
Alexandria City, VA	110,938	103,217	111,183	128,283	139,966	157,613	159,200	172,800	190,800	208,500
Fairfax City, VA	21,970	19,390	19,622	21,498	22,565	23,531	25,600	31,600	33,900	35,200
Falls Church City, VA	10,772	9,515	9,578	10,377	12,332	14,128	14,200	16,400	17,300	17,600
Washington, DC	756,510	638,333	606,900	572,059	601,723	692,683	729,500	842,200	940,700	987,200

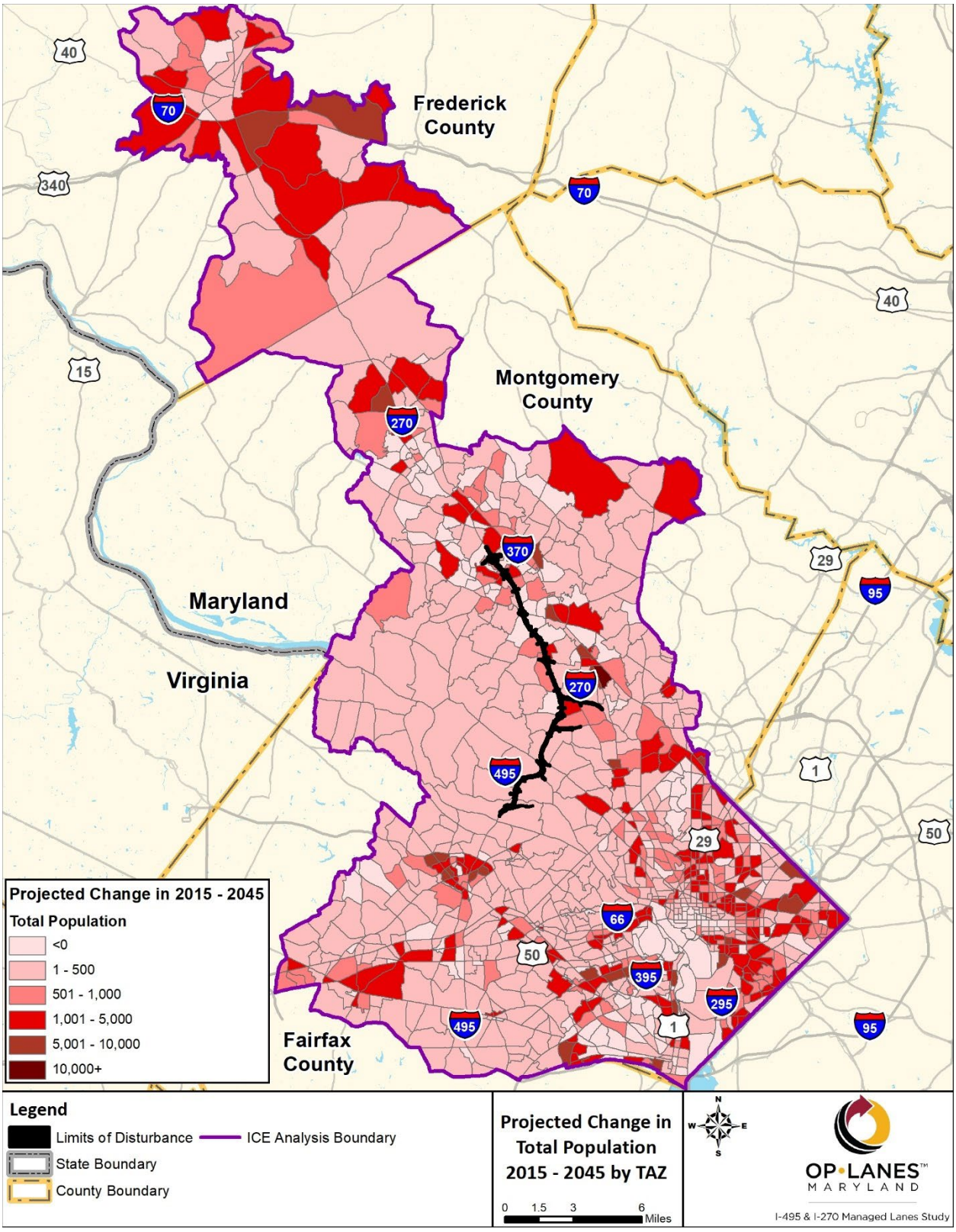
Sources: US Census Bureau Decennial Census (1970-2010); American Community Survey 5-Year estimates (2015-2019); MWCOG Round 9.1a Cooperative Forecasting.

Most ICE Analysis Area jurisdictions have seen substantial population growth since 1970. Montgomery County's population nearly doubled between 1970 and 2019, while Frederick County, the least populous of the two Maryland counties, nearly tripled with a growth of 196 percent. Fairfax County, the most populous of the ICE Analysis Area counties in Virginia, grew nearly 152 percent during that time. Arlington County grew by approximately 34 percent. The incorporated cities in Virginia of Alexandria, Fairfax City, and Falls Church have experienced growth of 42 percent, 7 percent, and 31 percent, respectively. Washington, DC has been the exception to this trend – its population declined by approximately 8 percent between 1970 and 2019. However, the population of Washington, DC has been rising since approximately 2000, when it was 24 percent below 1970 levels.

All of the ICE Analysis Area jurisdictions are projected to increase in population by 2045. Most are estimated to rise at a somewhat more modest pace compared to the prior decades, as the land uses become more mature and available land becomes scarcer. Washington, DC is estimated to continue rising in population, regaining the population lost since 1970 and exceeding it by 2030.

Figure 3-2 shows the estimated growth by TAZ between 2015 and 2045. Areas with the greatest population growth (shown in darker shades) are generally clustered around I-270 and I-495, in Washington, DC, and along other major roadway corridors such as I-66. In the Maryland portion of the ICE Analysis Area, areas with the greatest projected population growth are generally consistent with MDP PFAs shown in **Figure 3-1**.

Figure 3-2: Projected Population Growth 2015-2045 by TAZ



Source: MWCOG Round 9.1a Cooperative Forecasting

A notable concentration of population growth is forecast to occur near Frederick. The forecasts show that much of the existing low density residential areas are forecast to remain relatively stable in terms of population, while more dense development clustered in proximity to major transportation infrastructure is forecast to grow in many locations. This is consistent with the recommendations of the comprehensive plans outlined in **Section 3.1.1**.

Much of the housing growth occurred as farmland in the jurisdictions surrounding Washington, DC were converted to suburban residential uses. The growth in housing has gradually tapered off as developable land has been depleted in these areas; new housing growth primarily comes from infill, densification, and redevelopment of existing land uses. Housing is shown in **Table 3-7**.

Table 3-7: Housing 1970-2019

Year	1970	1990	2000	2010	2019
Montgomery County, MD	161,366	295,723	334,632	375,905	389,202
Frederick County, MD	26,292	54,872	73,017	90,136	97,486
Fairfax County, VA	130,787	307,966	359,411	407,998	413,885
Arlington County, VA	71,232	84,847	90,426	105,404	114,779
Alexandria City, VA	44,424	58,252	64,251	72,376	76,357
Fairfax City, VA	6,263	7,677	8,204	8,680	8,959
Falls Church City, VA	3,762	4,668	4,725	5,489	6,004
Washington, DC	278,444	278,489	274,845	296,719	315,176

Source: Census Bureau Decennial Census 1970, 1990, 2000, 2010; US Census American Community Survey 5-Year Estimates, 2015-2019. Note: Housing data for 1980 Decennial Census was not available on the US Census Bureau Website

Employment growth projections were obtained from MWCOG Round 9.1a Cooperative Forecasts, presented in **Table 3-8**. Employment is projected to grow between 2015 and 2045 for all jurisdictions in the ICE Analysis Area. Washington, DC is the greatest concentration of employment in the ICE Analysis Area, followed by Fairfax County and Montgomery County. Employment growth in Washington, DC is projected to rise by 247,100 (31 percent) between 2015 and 2045, Fairfax County by 235,800 (36 percent), and Montgomery County by 158,600 (30.5 percent) during that time.

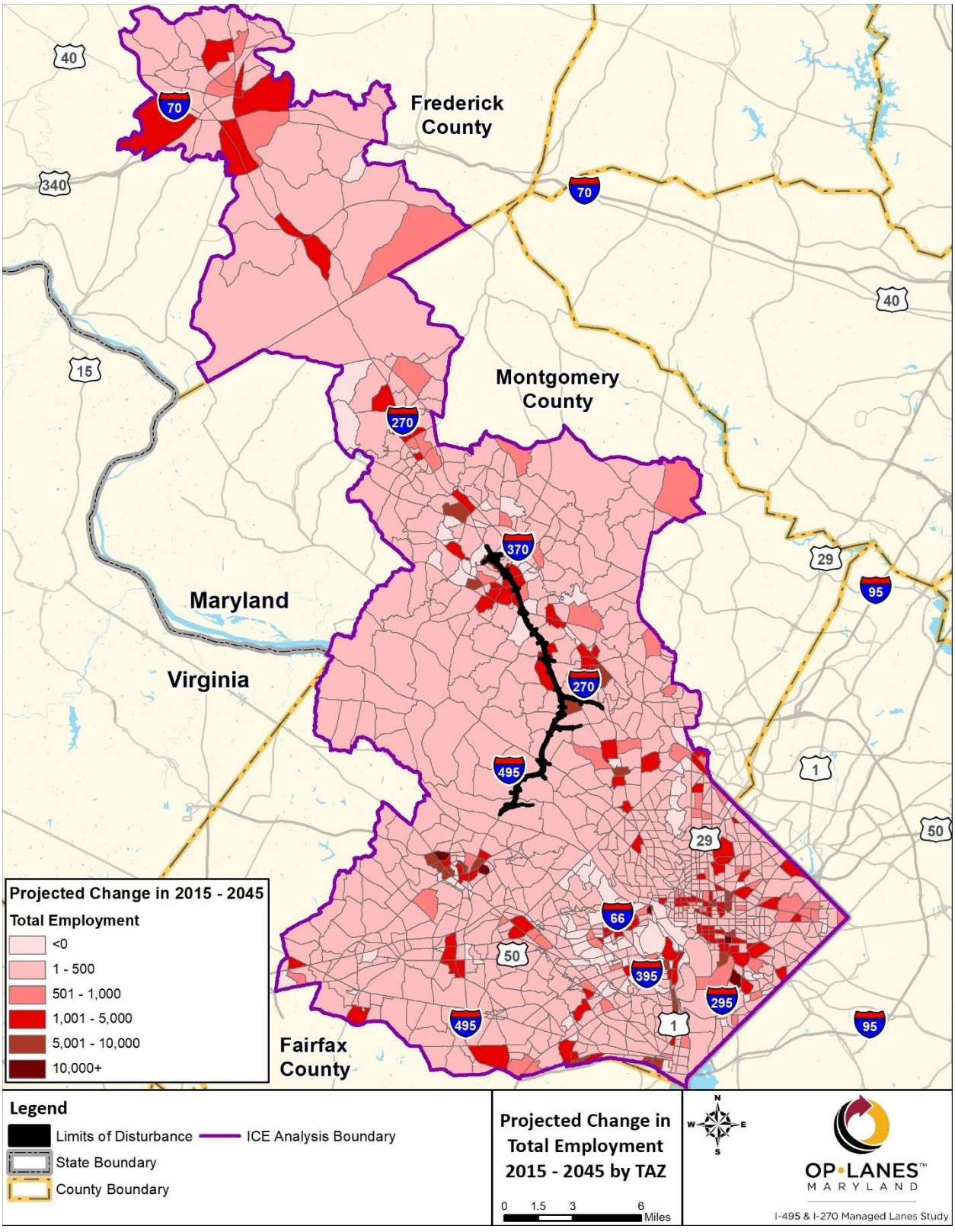
Table 3-8: Employment 2015-2045

Year	2015	2020	2030	2040	2045
Montgomery County, MD	520,200	543,500	604,500	653,900	678,800
Frederick County, MD	111,800	117,300	128,600	141,100	145,500
Fairfax County, VA	654,100	701,700	787,200	857,700	889,900
Arlington County, VA	209,700	216,900	238,400	261,000	269,100
Alexandria City, VA	106,200	110,100	127,300	142,700	155,100
Fairfax City, VA	20,800	22,900	23,100	23,300	23,400
Falls Church City, VA	12,000	14,300	17,600	18,300	18,600
Washington, DC	798,300	846,300	937,900	1,011,800	1,045,400

Source: MWCOG Round 9.1a Cooperative Forecasts

Figure 3-3 below shows the total estimated change in employment by TAZ for the ICE Analysis Area between 2015 and 2045, with greater employment growth forecast for darker shaded areas.

Figure 3-3: Projected Employment Growth 2015-2045 by TAZ



Source: MWCOG Round 9.1a Cooperative Forecasting

The forecasts predict growth clustered in central Washington, DC as well as other urban centers primarily located along major transportation infrastructure corridors such as I-495, I-270, and I-66. Similar to population growth shown above, several growth areas are located along I-495 and I-270. These growth areas are generally consistent with the location of MDP PFAs shown in **Figure 3-1**.

3.1.3 Future Development in the ICE Analysis Area

Future transportation and non-transportation development in the ICE Analysis Area has been summarized based on the following resources:

- 2016 Amended Constrained Long-Range Transportation Plan for the National Capital Region issued by the National Capital Region Transportation Planning Board (NCRTPB) (NCRTPB, 2016);
- Visualize 2045: A Long-Range Transportation Plan for the National Capital Region (MWCOG, 2018a)
- MWCOG's 2020 Commercial Construction Indicators (MWCOG, 2021a); and
- MWCOG's Regional Economic Monitoring Systems Report (MWCOG, 2021b).

Given the large extent of the ICE Analysis Area, the analysis of present and future major non-transportation and transportation developments within the boundary is broadly summarized below.

A. Residential and Commercial Development

MWCOG member jurisdictions include all the ICE Analysis Area jurisdictions and more. According to MWCOG's Round 9.1a Cooperative Forecast, the Metropolitan Washington Region will add more than 648,000 households between 2015 and 2045, for a total of approximately 2.66 million households. Fairfax County, the District of Columbia, and Montgomery County would have more than half of the expected household growth in the ICE Analysis Area. MWCOG has estimated the region will add 575,000 new housing units between 2018 and 2045, which averages to approximately 21,300 housing units per year (MWCOG, 2018b). Priority locations for such development include regionally identified Activity Centers and areas near existing high-capacity transit stations. Most of the household growth would occur in MWCOG Regional Activity Centers such as in the City of Alexandria, District of Columbia, and Arlington County (MWCOG, 2018b).

Commercial development in the MWCOG region declined by 29 percent in 2020 compared to 2019 (MWCOG, 2021a). Six of the ten largest development projects in the MWCOG region, by square footage, are located within the ICE Analysis Area. **Table 3-9** lists the top commercial construction projects in the ICE Analysis Area in 2020 (MWCOG, 2021a). Northern Virginia jurisdictions experienced approximately 43 percent of all the new construction studied by MWCOG. Last year in the ICE Analysis Area jurisdictions, 66 buildings were erected totaling 6.3 million square feet of space, primarily for offices and industrial/flex space. Future commercial development is anticipated principally in MWCOG Regional Activity Centers. As of 2020, just in the District alone, 197 near-term and 247 long-term commercial and residential projects totaling approximately 120 million square feet, valued at $37.1 billion, have been identified in the commercial and residential development project pipeline (Washington, DC Economic Partnership, 2020).

Additionally, the recently planned Amazon National Landing Headquarters located in Arlington and Alexandria would include 4.1 million square feet of development and house up to 25,000 employees (Business Insider, 2019).

Future residential and commercial development in the ICE Analysis Area will continue in accordance with land use and zoning specified in area master plans. None of the future projects identified are known to be dependent upon the I-495 & I-270 Managed Lanes Study.

Table 3-9: 2020 Top Commercial Construction Projects in the ICE Analysis Area

Project Name	Land Use	Jurisdiction
Sentinel Square III	Office	DC
2050 M Street	Office	DC
M-NCPPC HQ	Office	Montgomery County
Suburban Hospital – North Building	Hospital	Montgomery County
4040 Wilson at Liberty Center	Office	Arlington County
Georgetown Day School	School	DC

Commercial construction projects within the ICE Analysis Area that are among the 10 largest in the region, based on square footage

B. Transportation Projects

According to the Financially Constrained Element of MWCOG's *Visualize 2045: A Long-Range Transportation Plan for the National Capital Region* (NCRTPB, 2018), approximately 39 major roadway construction projects and 19 major transit projects are proposed in the ICE Analysis Area (**Table 3-10**). Some of the projects listed anticipate construction out to 2045. Billion-dollar projects in the ICE Analysis Area include the I-66 Outside the Beltway widening, I-270 Traffic Relief Plan, MD 355 BRT from Bethesda Metro to Clarksburg, Maryland Area Regional Commuter (MARC) capacity and frequency improvements, and Purple Line from Bethesda to New Carrollton. Almost all planned highway construction includes widening or upgrading existing roads rather than building new facilities.

None of the transportation projects listed in **Table 3-10** are dependent upon the improvements evaluated by the I-495 & I-270 Managed Lanes Study, because they are already included in other plans.

Table 3-10: Major Transportation Projects in the ICE Analysis Area

Jurisdiction	Project	Project Description	Anticipated Construction Year[4]
Major Roadway Projects			
DC	I-295/Malcolm X Avenue SE Interchange Improvement Project	Reconstruct interchange at Malcolm X Ave	2020
DC	I-395, 14th Street Bridge and DC approach to Bridge	I-395 - remove 3rd St SB exit ramp, reconfigure 3rd St SB entrance and 2nd St NB exit ramps, reconnect F St between 2nd and 3rd St	2019

[4] The anticipated construction year for major transportation projects in the ICE Analysis Area is based on listings in MWCOG's Financially Constrained Element of *Visualize 2045*, which was published in 2018. These dates may not be reflective of current conditions and assumptions regarding completion of these projects. An update to this plan is anticipated to be finalized in 2022.

Jurisdiction	Project	Project Description	Anticipated Construction Year[4]
DC	South Capitol Street Corridor Project	South Capitol St - convert to 6 lanes Urban Blvd, incl. Frederick Douglass Bridge Reconstruction	2021
DC	Lane Reductions/ Reconfigurations	Lane Reductions/ Reconfigurations for Bicycle Lanes	2020, 2024
Maryland	I-270 Traffic Relief Plan	I-270 Traffic Relief Plan, construct 4 managed lanes	2025
Maryland	I-70 – Widening	I-70 - widen to 6 lanes with interchange at Meadow Rd	2025, 2035
Maryland	I-270 Innovative Congestion Management	I-270 - "Innovative Congestion Management" project to include auxiliary lands & add'l improvements	2019
Maryland	I-270 – interchange at Watkins Mill Rd Interchange Project	I-270 - interchange at Watkins Mill Rd Ext	2021
Maryland	US 15 Catoctin Mountain Highway Monocacy Blvd Interchange	US 15 (Catoctin Mtn Hwy) - reconstruct intersection at Monocacy Blvd	2018
Maryland	US 15 Frederick Freeway and Catoctin Mountain Highway Widening	US 15 (Frederick Fwy and Catoctin Mtn Hwy) - widen to 6 lanes with interchange at Biggs Ford Rd	2030, 2040, 2045
Maryland	MD 28/MD 198 Corridor Improvement	MD 28 (Norbeck Rd)/MD 198 (Spencerville Rd) - widen to 4, 6 lanes	2045
Maryland	MD 85 Widening	MD 85 (Buckeystown Pke) - widen to 4, 6 lanes	2021, 2035
Maryland	MD 97 Widening	MD 97 (Georgia Ave) - widen to 7, 8 lanes	2025
Maryland	MD 97 Brookeville Bypass	MD 97 (Brookeville Bypass) - construct 2 lane bypass	2021
Maryland	MD 117 Widening	MD 117 (Clopper Rd) - widen to 4 lanes	2030
Maryland	MD 118 Widening	MD 118 (Germantown Rd) - widen to 4 lanes	2020
Maryland	MD 124 Widening	MD 124 (Woodfield Rd) - widen to 6 lanes	2035
Maryland	Mid County Hwy Extension	Mid County Hwy Extension (M-83) - construct 4, 6 lanes	2025
Maryland	Middlebrook Rd Extension	Middlebrook Rd Extended - construct 4 lanes	2025
Maryland	Montrose Pkwy Expansion	Montrose Pkwy East - construct 4 lanes	2025

Jurisdiction	Project	Project Description	Anticipated Construction Year[4]
Virginia	I-66 HOT (Inside Beltway) - Revise Operations	I-66 HOT (Inside Beltway) - revise operations from HOV 2+ to HOT during peak hours and bus service	2021, 2040
Virginia	I-66 HOT (Outside Beltway) Lane Widening	I-66 HOT (Outside Beltway) - widen to 6 lanes (3 GP, 2 HOT, and 1 auxiliary) and bus service	2021, 2040
Virginia	I-66 Vienna Metro Access Ramp	I-66 - construct HOV ramps to access Vienna Metro Station	2021
Virginia	I-66 Widening	I-66 – Extend existing westbound acceleration/deceleration lane	2020, 2022
Virginia	I-95/I-495 Interchange Reconstruction	I-95/I-495 - reconstruct interchange at Van Dorn St	2030
Virginia	Interstate 395 Express Lanes Extension -	I-395 HOT - additional lane and revise operation from HOV 3+ during peak to HOT 3+	2019
Virginia	I-395 Expansion	I-395 - construct new south bound lane	2018, 2020
Virginia	I-495 Hot Lanes Expansion	I-495 - construct 4 HOT lanes	2025
Virginia	I-495 Auxiliary Lane Expansion	I-495 Auxiliary Lanes - construct 2 auxiliary lanes in both directions	2030
Virginia	I-495 Interchange	I-495 - interchange at VA 267	2030
Virginia	Dulles Toll Rd (VA 267) - Interchange	Dulles Toll Rd (VA 267) - interchange at New Boone Blvd Ext	2037
Virginia	Dulles Toll Rd (VA 267)- Interchange	Dulles Toll Rd (VA 267) - interchange at Greensboro Dr / Tyco Rd	2036
Virginia	US 29 (Lee Hwy) Widening	US 29 (Lee Hwy) - widen to 3, 6 lanes	2025
Virginia	US 50 (Arlington Blvd) Widening and Reconstruction	US 50 (Arlington Blvd) - widen/reconstruct 6 lanes including interchanges	2025
Virginia	VA 7 (Leesburg Pke) Widening	VA 7 (Leesburg Pke) - widen to 6 lanes	2021
Virginia	VA 7 (Leesburg Pke) Widening	VA 7 (Leesburg Pke) - widen to 6, 8 lanes	2025, 2030
Virginia	VA 7 (Leesburg Pke) Widening	VA 7 (Leesburg Pke) - widen to 6 lanes	2025
Virginia	VA 123 (Chain Bridge Rd) Widening	VA 123 (Chain Bridge Rd) - widen to 8 lanes	2021
Virginia	VA 236 (Little River Tpke) - Widening	VA 236 (Little River Tpke) - widen to 6 lanes	2030
Major Transit Projects			
DC	DC Streetcar Expansion	DC Streetcar	2023, 2026

Jurisdiction	Project	Project Description	Anticipated Construction Year[4]
DC	DC Dedicated Bicycle Lane Network	New bike lanes	2019, 2024
DC	Bus Improvements	16th Street Bus Priority Improvements	2021
Maryland	Corridor Cities Transitway	Corridor Cities Transitway BRT - from Shady Grove to COMSAT	2020
Maryland	North Bethesda Transitway	North Bethesda Transitway BRT - from Montgomery Mall to White Flint Metro	2040
Maryland	Veirs Mill Rd BRT	Veirs Mill Rd BRT - from Wheaton Metro to Rockville Metro	2030
Maryland	Randolph Rd BRT	Randolph Rd BRT - from US 29 to MD 355	2040
Maryland	New Hampshire Ave. BRT	New Hampshire Ave. BRT - from Takoma Metro to Colesville P&R	2045
Maryland	US 29 BRT	US 29 BRT - from Silver Spring Metro to Burtonsville P&R	2020
Maryland	MD 355 BRT	MD 355 BRT - from Bethesda Metro to Clarksburg	2040
Maryland	MARC Improvements	MARC - Increase trip capacity and frequency along all commuter rail lines	2029
Maryland	Purple Line	Purple Line from Bethesda to New Carrollton	2020
Virginia	Crystal City Transitway Extension	Crystal City Transitway: Northern Extension BRT	2023
Virginia	Duke Street Transitway Extension	Duke St Transitway - King St Metro to Fairfax County line	2024
Virginia	Potomac Yard Metrorail Station Project	Potomac Yard Metro Station	2021
Virginia	West End Transitway Extension	West End Transitway - Van Dorn St Metro to Pentagon Metro	2024
Virginia	Virginia Railway Express	VRE - Reduce headways along the Manassas and Fredericksburg Lines	2020
Virginia	I-495 Express Bus Service	I-495 HOT Lane Express Bus Service	2030
Virginia	I-66 HOT Lane Enhancement of Bus Services	I-66 HOT Lane Enhanced Bus Service	2025, 2040

Source: MWCOG Visualize 2045: A Long-Range Transportation Plan for the National Capital Region (NCRTPB, 2018)

3.2 ICE Analysis Results

This section presents the results of the ICE analysis. As discussed in **Section 2.2.1**, the same socioeconomic, natural, and cultural resources directly affected by the Preferred Alternative are included

in the analysis of indirect and cumulative effects. No additional resources were identified beyond those directly affected. **Table 3-11** provides an overview of the resources evaluated in the ICE analysis.

Table 3-11: ICE Analysis Resources

Category	Resources Considered
Socioeconomic Resources	Land Use Residences Businesses Community Facilities Community Cohesion Demographics
Cultural Resources	Historic Architecture Archaeological Resources
Natural Resources	Surface Water Wetlands Floodplains Forest Wildlife and Wildlife Habitat Sensitive Species
Air Quality	Air Quality

Access to/from the managed lanes would be provided via direct access ramps at select interchanges, at-grade auxiliary lanes where ingress to the managed lanes from the GP lanes or egress from the managed lanes to the GP lanes would be provided, and at the end points of the Preferred Alternative.

3.2.1 Socioeconomic Resources

This analysis of indirect and cumulative effects considers land use, residences, businesses, community facilities, community cohesion, and demographics.

A. Indirect Impacts

The indirect effects of worsening traffic congestion under the No Build Alternative could include loss of economic productivity, changes in community cohesion resulting from reduced access and delays, effects on the desirability of communities, and potential changes to individual decisions about where to live and work. While no resources are anticipated to be directly impacted by a No Build Alternative, the No Build Alternative does include currently planned and programmed infrastructure projects that may affect the ICE Analysis Area. Moreover, under the No Build Alternative motor vehicle volumes are forecasted to increase over time and with them are anticipated increases in travel times and delays related to growing traffic congestion. Worsening traffic congestion could have potential negative effects on motor vehicle-reliant activities, such as emergency response services, supply chain/commercial trucking and deliveries, school bus schedules, and workforce commuters.

The Preferred Alternative would include expansion of existing highway facilities and implementation of managed lane strategies. The Preferred Alternative could change travel patterns by providing increased capacity along existing facilities. Communities along connecting roadways could experience noise impacts due to changes in traffic volumes.

I-495 and I-270 are fundamental links in the regional transportation system in the Washington, DC metropolitan region, serving as the backbone of the roadway network in the ICE Analysis Area. Roadway improvements, such as those proposed under the Preferred Alternative, can be an attraction to commercial or real estate development. The possibility of induced growth in this study area would be diminished by the reduced Phase 1 South limits of the Preferred Alternative, the long-term presence of the existing highway, and the mature land uses and developments that have occurred in the ICE Analysis Area.

As a result, the likelihood of induced commercial or residential development is reduced substantially by the built-out environment that has been in existence for many years. Moreover, much of the undeveloped land within the ICE Analysis Area is designated by comprehensive plans for preservation. Comprehensive plans in the ICE Analysis Area, particularly those areas closest to the study area corridors in the counties immediately surrounding Washington, DC, emphasize managing new growth in order to preserve the character of existing residential areas. The growth anticipated in these well-developed portions of the ICE Analysis Area is generally planned to be directed into designated hubs near major transportation facilities and MDP-designated PFAs. Indirect impacts would be minimized by adhering to existing master plans and zoning regulations pertaining to new development.

Provision of new capacity through managed lanes along I-495 and I-270 could result in increased demand for growth in the ICE Analysis Area by allowing greater accessibility to employment and other land uses along the corridors and in Washington, DC. The degree to which new growth would occur, beyond that which would occur under the No Build Alternative, cannot be determined with certainty. Factors such as economic conditions and potential future changes to local plans and land use policies can create a degree of uncertainty in predicting future indirect land use effects. The new capacity from the Preferred Alternative would largely accommodate existing traffic from past growth (as evidenced by the extremely poor traffic conditions seen today and described in the Purpose and Need chapter) along with reasonably foreseeable traffic growth that is expected to occur regardless of the Preferred Alternative. It is also reasonably foreseeable that some level of increased development would likely occur, beyond that which would occur under the No Build Alternative.

To further evaluate the Study's growth implications, consistency with MDP's Planning Policy, and compliance with the Priority Funding Area Law, Smart Growth Coordination Checklists were prepared by MDOT SHA and are included in **Appendix C** of the *Final Community Effects Assessment and Environmental Justice Technical Report* (**FEIS, Appendix F**). In an email dated January 12, 2022, MDP concurred with Planning Act consistency and PFA Law compliance determinations for the Study.

It was determined that while the Preferred Alternative is located entirely within PFAs, the proposed action could likely have indirect induced growth impacts outside of PFAs. Outside of PFAs in Montgomery County, large lot development, or areas where sprawl is likely to occur, would be limited to low development capacity. Areas along the northern portion of the ICE Analysis Area near Frederick, Maryland would be the most vulnerable to new development pressure. Areas of undeveloped farmland still remain relatively close to I-270, near the boundary between Montgomery and Frederick Counties. Improved travel times along I-270 could lead to increased pressure for development in these areas. This demand for development would be subject to existing zoning regulations and comprehensive plans, which are largely focused on directing new development into desired locations and avoiding consumption of natural

resource lands. The designated community growth areas in Frederick County would most likely experience increased demand for development. Rural and suburban areas in northern Montgomery County may see increased pressure for development, particularly the areas with the most access to I-270.

The population is expected to continue to increase within the ICE Analysis Area. This will create additional demands on community facilities and services, such as parks, schools, health and emergency services, and utilities. The Preferred Alternative could help to facilitate population and employment growth; however, it is not expected to substantially change the existing trends in the ICE Analysis Area, as the project is designed to accommodate existing and planned transportation demand. Much of the need for the project derives from past growth which has led to congested conditions and need for additional capacity.

Generally, improvements proposed under the Preferred Alternative would occur within and adjacent to the existing highway corridor. The Preferred Alternative would not reduce the number of free GP lanes and is expected to reduce congestion on all travel lanes. Therefore, indirect community impacts due to cut-through traffic would be minimal. For additional discussion of community impacts, refer to the *Final Community Effects Assessment Technical Report* (**FEIS, Appendix F**).

B. Cumulative Impacts

Past actions that have impacted socioeconomic resources include the numerous infrastructure and land development activities that occurred in the ICE Analysis Area throughout the ICE time frame. As described in **Section 3.1.2**, jurisdictions in the ICE Analysis Area have experienced substantial growth of population, housing, and employment since 1970. For example, Montgomery County's population nearly doubled between 1970 and 2019, according to US Census ACS 2015-2019 five-year estimates. This growth and development in the ICE Analysis Area has entailed continuous expansion and intensification of urban and suburban land uses into previously rural landscapes. Similarly, the network of transportation infrastructure has been continually expanded to accommodate the transportation needs of the growing regional economy and population.

Present and future actions impacting socioeconomic resources include the land development and infrastructure improvements required to accommodate existing and future populations and economic activity. MWCOG estimates show ICE Analysis Area jurisdictions growing in population and employment through 2045. Demand from existing populations and economic activity has created substantial traffic congestion in the region, and many currently planned projects are intended to accommodate this existing demand. Future projects, as described in **Section 3.1.3,** will continue to expand infrastructure capacity to meet the needs of the growing population. The proposed action could likely have cumulative induced growth impacts outside of PFAs, especially considering the indirect and cumulative impacts that could result from the potential future I-270 project from I-370 to I-70, which is currently under a Pre-NEPA study.

The past, present and future actions have had both beneficial and adverse impacts to socioeconomic resources. Past and present growth and development has improved local economies and led to provision of community facilities, transportation infrastructure, and recreational resources benefiting residences and businesses. Construction and expansion of transportation facilities has facilitated economic growth by providing access to employment and community facilities and allowing for more efficient movement of goods and services. The I-270 North Pre-NEPA Study, a separate part of the overall Traffic Relief Plan mentioned above, may have effects to similar resources along the I-270 corridor.

Increased population and employment in the ICE Analysis Area is expected to increase traffic volumes and create eventual need for more transportation improvement projects. The proposed action is one of many reasonably foreseeable future transportation projects designed to address both existing volumes, as well as anticipated growth. The Preferred Alternative would provide improved access, mobility, and traffic conditions. Combined with the other projects identified above in **Section 3.1.3B**, it is anticipated that there would be a greater overall benefit to local communities.

Past transportation projects have had impacts to communities such as residential and business displacements, noise, visual, and community cohesion impacts. Some examples of major past projects with community impacts include the Intercounty Connector (MD 200) completed in 2014 and the previous widening of I-270 completed in 1990. A current major project with community impacts is the Purple Line, currently under construction.

The No Build Alternative, considered in the context of growth and development occurring throughout the ICE Analysis Area, would result in potentially negative socioeconomic impacts from increasing traffic congestion. The effects of worsening traffic congestion could include loss of economic productivity, changes in community cohesion resulting from reduced access and delays, effects on the desirability of communities, and potential changes to individual decisions about where to live and work.

The Preferred Alternative would result in impacts to land use, residences, businesses, and community facilities.

The total right-of-way required (outside of existing highway right-of-way) is 92.8 acres. The Preferred Alternative would require 2.7 acres of commercial/employment land use, 2.8 acres of industrial use, 18.9 acres of mixed-use, 22.1 acres of parks and open space, 8.4 acres of planned unit/planned community, 37.9 acres of residential, and <0.1 acres of transportation.

The Preferred Alternative would impact property from eleven community facilities, including one correctional facility, one recreation center, two healthcare facilities, two schools, four places of worship, and one historic cemetery. The assumed property impacts include incorporation of strips of land along the highway right-of-way into the transportation facility right-of-way from community facilities from the edges of undeveloped areas or areas of trees. More detailed discussion of potential community facility impacts is included in the *Final Community Effects Assessment Technical Report* (**FEIS, Appendix F**).

The overall impact on residences, businesses, and community facilities has been greatly reduced with the Phase 1 South limits of the Preferred Alternative; other large projects of similar regional importance have had greater impacts. The continual expansion of transportation facilities in the region, while providing benefits of increased access and mobility, also has detrimental effects on communities adjacent to these facilities, including potential loss of community cohesion. However, with the reduced Phase 1 South limits, the Preferred Alternative would not impact the existing sense of community cohesion of communities along the study corridors. Additionally, the Preferred Alternative would not require relocations or displacements for residences, businesses, or community facilities, therefore it would not contribute to the incremental impact of displacing residences, businesses, and community facilities in the ICE Analysis Area.

Further, the overall impact to environmental justice (EJ) populations has been greatly reduced with the Phase 1 South limits of the Preferred Alternative. The Preferred Alternative avoids all residential and

business relocations in EJ areas. Additionally, community facilities within EJ areas would not be impacted. Effects to human health and safety, air quality, noise, vibration, water quality, hazardous material sites, natural resources, visual landscape and aesthetic values, economy and employment, access and mobility, community cohesion and quality of life, and tolling considerations would be distributed consistently throughout the study corridor and would be mitigated to the greatest extent applicable. As such, physical impacts and effects to other environmental characteristics would not be considered disproportionately high or adverse in potential EJ populations. Refer to *Section 5.8* of the *Final Community Effects Assessment and Environmental Justice Technical Report* (**FEIS, Appendix F**) for detailed discussion on the determination of whether disproportionately high or adverse impacts to EJ populations would occur under the Preferred Alternative. While past, present, and future projects would likely have impacts to potential EJ populations, the Preferred Alternative is not expected to contribute substantially to the incremental impact on these populations.

The Preferred Alternative would require a wider overall right-of-way contributing to the cumulative effects to community cohesion resulting from past, present, and future transportation and development projects. Improvements along I-495 and I-270 would be to existing roadway facilities where communities have previously been separated by their original construction, or later grew around them. Improvements to these corridors would be at the periphery of established communities and would not bisect residential areas or create new impediments to travel through communities. Therefore, the incremental effect of this widening would be small relative to the existing effect of the highways, which already divide and impede local travel between communities immediately adjacent to the corridors. Many of the communities affected by the wider right-of-way would also benefit from the improved functioning of the facility for longer distance travel.

Impacts to parklands and recreational facilities have occurred from past transportation and development projects, such as right-of-way, noise, and visual impacts from construction and expansion of transportation facilities. However, such impacts have been limited by the regulations implementing Section 4(f) of the USDOT Act of 1966. Additionally, any parklands acquired by local jurisdictions with funding from the Land and Water Conservation Fund Act (LWCF) or the Maryland Program Open Space, require in-kind replacement of any LWCF or Program Open Space parkland that is converted from public recreational use.

Furthermore, local jurisdictions have expanded park facilities in response to growing populations. For example, the 1964 Master Plan for Montgomery County notes that County holding of park lands was 6,500 acres when the plan was published (M-NCPPC, 1964); the 2017 Park, Recreation and Open Space (PROS) Plan notes that Montgomery County currently owns over 36,000 acres of parkland (Montgomery Parks, 2017). The 2017 Fairfax County Parks and Recreation System Master Plan notes that the Fairfax County Park Authority currently owns over 23,000 acres of parkland (Fairfax County Park Authority, 2017). While impacts to parklands and recreational facilities have occurred during the past time frame, they have likely been offset by increases in overall parkland acreages, and major impacts from future projects would be limited due to federal, state, and local laws and regulations preserving parklands. Past and present transportation improvements have also provided benefit to parks and recreational facilities by increasing access. New park facilities will continue to be developed in Montgomery County in the future, as outlined in the 2017 PROS Plan (Montgomery Parks, 2017) and in Fairfax County, as outlined in the 2017 Parks and Recreation System Master Plan (Fairfax County Park Authority, 2017).

The Preferred Alternative would impact 30.2 acres of parkland along the study corridors. In Fairfax County, 4.4 acres of the National Park Service (NPS) owned George Washington Memorial Parkway would be impacted by the Preferred Alternative. In Montgomery County, the approximately 25.8 remaining acres of impact would be to twelve park properties owned by either NPS or local jurisdictions. The impacts to parklands would be partial property acquisitions of narrow strips of right-of-way taken along the existing roadway corridors and would not have the effect of bisecting existing facilities in most instances. See the *Final Section 4(f) Evaluation* (**FEIS, Appendix G**) for more detailed information on park impacts, avoidance, and mitigation measures.

The incremental effect of these park impacts would be small relative to the overall amount of park lands in the ICE Analysis Area and when considering the planned development of new park facilities in Montgomery and Fairfax Counties. The Preferred Alternative has been developed to minimize park impacts relative to other major regionally important projects of comparable size. Future parkland development may occur in areas not in close proximity to the parklands impacted by the Preferred Alternative, thus reducing the access to parklands in the communities served by those parks. Reduction of parkland could be felt more acutely in urban areas, given the developed nature of surrounding land uses and minimal availability of land to convert to new parklands. Furthermore, the overall ratio of parkland acres to population in Montgomery and Fairfax Counties may be affected if new parks are planned to accommodate expected population growth. The Preferred Alternative would add to the impacts from other past, present and future projects to parklands in communities adjacent to the I-495 and I-270 corridors, often in well-developed areas where replacement parkland could not be easily located. Therefore, there would likely be an incremental impact felt by communities in close proximity to the impacted parks, in consideration of the overall cumulative effect. Extensive coordination with the Officials with Jurisdiction over impacted parklands has occurred to identify and incorporate minimization and mitigation measures in accordance with Section 4(f), as described in the *Final Section 4(f) Evaluation* (**FEIS, Appendix G**).

3.2.2 Cultural Resources

Section 106 of the National Historic Preservation Act and Section 4(f) of the 1966 USDOT Act mandate protection of historic sites, and minimization and/or mitigation for any unavoidable impacts associated with federally-funded projects. 36 CFR 800.5(1) notes that adverse effects "may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative". Additional Section 106 coordination among MDOT SHA, FHWA, MHT and others has taken place since the publication of the DEIS. Consultation has continued to avoid and minimize impacts and the development of the Programmatic Agreement (PA) (**FEIS, Appendix J**).

A. Indirect Impacts

Potential indirect effects could occur to historic properties resulting from increased population growth and development in the Area of Potential Effects (APE). However, these areas are subject to many greater economic and demographic pressures producing increased population and development that are not caused by the Study. Development of new land uses or more intensive land uses could lead to destruction or degradation of these resources, as older structures are cleared to make way for new construction, or agricultural and rural areas are converted to more intensive urban and suburban uses with resulting changes in land use context surrounding cultural resource areas. Archeological sites could also be

impacted by new construction accompanying land development. Thus, land development can lead to destruction or altering the integrity of historically important characteristics of archeological and architectural historic properties. These resources benefit from protections offered by existing federal and state laws and local planning ordinances. Therefore, the potential indirect effects to cultural resources would likely be avoided or minimized by reasonably anticipated compliance with those laws.

B. Cumulative Impacts

Past actions that have impacted historic properties include the numerous infrastructure and land development activities that have occurred in the APE. The APE has experienced substantial growth of population, housing, and employment since the mid twentieth-century. This has resulted in destruction or degradation of historic properties, including demolition for new construction and/or changes in land use. Present and future actions, including transportation projects and land development activity, would likely continue to impact cultural resources in similar ways. For transportation projects, however, existing protective regulations and consultation requirements associated with Section 106 and Section 4(f) resources would minimize and mitigate for such effects, reducing the overall net effect to historic properties. Potential future impacts to cultural resources from non-transportation projects would also be subject to applicable federal, state, and local planning ordinances that protect many of these resources.

There are no planned developments within the APE that are dependent on completion of the Preferred Alternative. The Study is responding to other large-scale pressures resulting in increased population and development that result in depleted capacity and congestion on I-495 and I-270; it is not the cause of generalized degradation of historic properties in the APE due to development. As a result, there are no indirect adverse effects to historic properties specifically caused by the undertaking.

The Preferred Alternative would impact 14 known historic architectural resources. Impacts to historic properties would primarily consist of the incorporation of strips of land along the highway right-of-way into the transportation facility to accommodate mainline widening and stormwater management facilities. The Preferred Alternative would have adverse effects to four historic properties, including the Chesapeake and Ohio Canal National Historical Park, George Washington Memorial Parkway/Clara Barton Parkway, Gibson Grove A.M.E. Zion Church, and Washington Biologists' Field Club on Plummers Island. No properties are proposed for complete demolition or destruction but contributing features of some properties would experience physical impacts of varying degrees or diminishment of the integrity of setting. Refer to the *Final Cultural Resources Technical Report* (**FEIS, Appendix I**) for additional details on impacts to historic properties.

Much of the past, present, and future growth in the study area concentrates in population centers close to the I-495 and I-270 corridors, in close proximity to where the Preferred Alternative impacts would occur. While the Preferred Alternative is subject to compliance with Section 4(f) and Section 106 regulations that limit the direct impact of the project on cultural resources, the impacts would occur in areas where continual growth and urbanization have likely had adverse effects on cultural resources. The relatively minor incremental effect of the project would thus contribute to the overall degradation of cultural resources in the ICE Analysis Area, in light of other past, present and future actions.

3.2.3 Natural Resources

Direct impacts to natural resources are summarized in **Table 3-12** and described below, followed by discussion of potential indirect and cumulative effects for each resource category. Refer to the *Final Natural Resources Technical Report* (**FEIS, Appendix M**) for a more detailed discussion of natural resource impacts.

Table 3-12: Natural Resource Direct Impacts from the Preferred Alternative

Resource	Acres
Surface Water (linear feet)	42,286
Wetlands (acres)	3.9
100-Year Floodplain (acres)	31.6
Unique and Sensitive Areas (acres)	163.0
Targeted Ecological Areas	55.9
Green Infrastructure Hubs	23.8
Green Infrastructure Corridors	83.4
Rare Threatened and Endangered Species Habitat (acres)	54.8
FIDS (acres) (Developed by CRI)	11.3
Forest Canopy (acres)	455.0

A. Surface Water

Section 401 and Section 402 of the federal Clean Water Act (CWA) (33 United States Code (U.S.C.) 1341-1342) regulate water quality and the introduction of contaminants to waterbodies. The MDE and VDEQ are the regulatory agencies responsible for ensuring adherence to water quality standards in Maryland and Virginia, respectively.

Under the Code of Maryland Regulations (COMAR): Title 26 Department of the Environment, Subtitle 08 Water Pollution, Chapter 02 Water Quality (26.08.02), the State of Maryland has adopted water quality standards to enhance and protect water resources and serve the purposes of the federal CWA. Similarly, all of Virginia's surface waters are classified by VDEQ according to designated uses promulgated in Virginia's water quality standards (9 VAC 25-260).

MDE has also designated certain surface waters of the state as Tier II (High Quality) waters, based on monitoring data that documented water quality conditions that exceeded the minimum standard necessary to meet designated uses. In accordance with federal antidegradation regulations (40CFR131.12), these waters are afforded additional antidegradation protections to ensure that these high-quality waters are maintained (COMAR 26.08.02.04-1). Impacts to Tier II waters are reviewed by MDE for certain state permits and approvals (including Wetlands and Waterways permits and authorizations), with the purpose of preventing degradation to high quality waters as a result of permitted activities. The review process would identify impacts, examine potential avoidance of these impacts, as well as potentially requiring additional minimization measures to further protect water quality.

At the Federal level, jurisdictional Waters of the U.S. (WOTUS), which includes wetlands and surface waters, are afforded regulatory protection under Section 404 of the Clean Water Act (CWA). Section 404 also identifies jurisdictional wetlands as Special Aquatic Sites. Special Aquatic Sites are defined as "areas possessing special ecological characteristics of productivity, habitat, wildlife protection, or other

important and easily disrupted ecological values." The U.S. Environmental Protection Agency (USEPA) and U.S. Army Corps of Engineers (USACE) share responsibility for implementing Section 404, which specifically regulates dredge and fill activities affecting WOTUS.

In compliance with CWA Sections 303(d), 305(b), and 314 and the Safe Drinking Water Act (SDWA), states develop a prioritized list of waterbodies that currently do not meet water quality standards. The 303(d) prioritized list includes those waterbodies and watersheds that exhibit levels of impairment requiring further investigation or restoration. MDE and VDEQ use monitoring data to compare stream conditions to water quality standards and determine which streams should be listed. The waterbodies on this list may be subject to a total maximum daily load (TMDL) of these constituents under Section 303(d) of the CWA. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards.

The Preferred Alternative is located within the Potomac River drainage basin (refer to **Figure 2-1**), and crosses both the Middle Potomac-Catoctin and Middle Potomac-Anacostia-Occoquan watersheds. The Preferred Alternative would directly impact approximately 42,286 linear feet of waterways (**Table 3-12**).

a. Indirect Impacts

Indirect impacts of the Preferred Alternative would result from effects related to changes in facility-related run-off quality and quantity associated with changes in drainage patterns and imperviousness. These changes may lead to increased erosive stream flows or reduced infiltration and stream base flows over time. Both indirect and direct project-related impacts could affect aquatic habitat and biota in the immediate study area, as well as upstream or downstream of the project. Culvert augmentation/modification is proposed at some locations to meet roadway design criteria or ensure no increase in upstream flood impact. It is unlikely that culvert augmentation/modification would indirectly change drainage patterns as the culvert will continue to convey stream flow in the same location.

Indirect downstream impacts to surface water would be minimized through the implementation of strict erosion and sediment control plans and stormwater-related best management practices (BMPs). In addition, detailed hydrologic and hydraulic analysis will be completed as required per MDE permitting/COMAR to ensure that the proposed culvert augmentation/modification does not result in negative flood impacts to other property owners or negative impacts to channel stability. Coordination with state and local agencies overseeing water resources in the ICE Analysis Area has continued throughout the Study to determine appropriate mitigation for impacts.

As noted above, improved traffic flow along existing transportation corridors would provide better accessibility to employment and other land uses in the analysis area. As such, indirect impacts could also occur from increased demand for development in areas with improved access. Less-developed areas in the ICE Analysis Area, such as those near Frederick, Maryland and northern Montgomery County, would be most susceptible to increased demand for new development. Conversion of land from rural to urban and suburban uses could result in an increase in impervious surfaces affecting watersheds in the ICE Analysis Area. Such development would be subject to applicable state and local regulations regarding land use, imperviousness, and tree and forest requirements, floodplain buffers, stormwater, and sediment and erosion control measures.

b. Cumulative Impacts

Within the ICE Analysis Area and throughout the region, past and current land use practices and development have impacted the relative health of surface waters despite existing regulations, plans and policies. Of particular concern to surface waters are the interrelated effects of loss of native vegetative cover, and increased stormwater flows, flooding, land surface and stream channel erosion, and sediment deposition during and after development. These combined negative effects typically accompany increases in land surface imperviousness over time.

According to the 2010 *Montgomery County Water Resources Functional Master Plan*: "State and County monitoring data show that water quality is continuing to degrade in many portions of Montgomery County and regionally as growth continues, especially in older developed areas and areas with increasing impervious cover." (Montgomery Planning, 2010).

The plan goes on to state: "County monitoring shows that urban and suburban streams are generally in fair to poor condition while less densely developed watersheds often are in good and in some cases excellent condition. This pattern supports the correlation between higher levels of imperviousness and lower water quality, a trend that supports accommodating future growth in existing urban areas near transit as opposed to developing in greenfields, which would increase impervious cover." (Montgomery Planning, 2010).

The 2010 *Montgomery County Water Resources Functional Master Plan* includes an evaluation of nutrient loading compared between existing (2010) and 2030 conditions. The plan predicted "minor changes" in nutrient loading between existing land cover and 2030 scenarios. The plan also noted, "These results are not unexpected because there is little vacant land left for new development in the County, and therefore no significant land conversion scenario options remain." (Montgomery Planning, 2010).

The *Montgomery County Water Resources Functional Master Plan* also states, "Accordingly, future land use and development patterns will not significantly influence water quality trends. Strategies such as Environmental Site Design on redeveloped and infill properties, retrofitting older development, and stream restoration will be necessary to protect and improve water quality." (Montgomery Planning, 2010.)

In the *Frederick County Water Resource Element of the Water and Sewerage Plan,* it is noted that more developed watersheds surrounding Frederick have the highest level of impervious cover compared to more rural areas in the county (Frederick County, 2010b). These areas are identified as priority mitigation areas to prevent further increase in imperviousness and the resulting water quality impacts.

Adverse effects on stream and water quality are likely to continue as existing forest and agricultural lands are converted to residential and other urban uses. Transportation facilities will continue to be expanded and improved to accommodate growing populations and economic activity. Local comprehensive plans and development regulations will primarily focus new growth in urbanized areas near major transportation facilities, in watersheds which are already impacted. Conversion of agricultural and forest land to developed uses is likely to have less impact in the future time frame in areas with more highly developed land use patterns, such as southern Montgomery County, where the conversion of agricultural

and forest land to developed uses has slowed and new development is primarily infill. Other areas, such as Frederick County, may experience further conversion to developed uses and impervious surfaces.

Future development and transportation projects would likely result in lesser impacts than past activities, because of state and local regulations pertaining to imperviousness, tree and forest requirements, floodplain buffers, stormwater, and sediment and erosion control measures designed to minimize impacts to surface waters and general watershed health.

Any unavoidable direct impacts will be regulated under state and federal wetlands and waterways permits issued for the project. As part of the permitting process, a detailed compensatory mitigation package, including final mitigation design, has been submitted to the USACE and MDE for review and approval prior to permit issuance.

The Preferred Alternative would have direct impacts to surface waters and watershed characteristics in the corridor study boundary including ephemeral, intermittent, and perennial stream channels. Because the Preferred Alternative would improve existing roadways, the direct stream channel impacts are primarily related to culvert and bridge extensions. The Preferred Alternative would impact approximately 42,286 linear feet (**Table 3-12**). No Tier II streams would be directly impacted.

Based on the Preferred Alternative direct and indirect impacts, the current mitigation requirement estimate in Maryland includes 7,511 functional feet of stream credits. Off-site compensatory nontidal wetlands and waterways mitigation in Maryland consists of two permittee-provided mitigation sites located in the Middle Potomac-Catoctin watershed, including a total of 6,304 FF of potential stream mitigation credits. The remaining required stream mitigation credits will be provided by purchasing credits from a mitigation bank that will have an initial credit release in the fall of 2022. In Virginia, mitigation requirements will be met through the purchase of privately-owned mitigation bank credits to meet the estimated requirement of 472 riverine mitigation credits. Additional detail is provided in **FEIS**, **Chapter 5** and the *Final Compensatory Wetlands and Waterways Mitigation Plan* (**FEIS, Appendix O**).

The Preferred Alternative would result in an increase in impervious surface within the watersheds that contain the I-270 and I-495 corridors, adding to the cumulative effect of other activities accompanying growth and urbanization in the ICE Analysis Area. Surface water quality in the ICE Analysis Area watersheds is generally linked to the level of development activity and impervious surfaces. While they would contribute (directly and indirectly) to the continuing urbanization and growth of the ICE Analysis Area, the Preferred Alternative would include improvements in already highly developed areas. As such, the Preferred Alternative would likely have a lower incremental effect than that of a facility in a new location, or in an undeveloped watershed with minimal impervious surface.

The incremental impact of the additional impervious surface from the Preferred Alternative on surface water quality would be further minimized by stormwater management measures. Water quality would be protected by implementing strict erosion and sediment control plans with best management practices appropriate to protect water quality during construction activities. Post-construction stormwater management and compliance with TMDLs would be accounted for in the stormwater design and water quality monitoring to comply with required permits.

B. Wetlands

Wetland impacts are subject to regulatory jurisdiction under Section 404 of the CWA (33 U.S.C. 1344). Wetlands and streams within the study corridors were delineated by environmental scientists on behalf of MDOT SHA and VDOT from March 2018 through October 2021, with delineation areas revised as the LOD was refined. A total of 66 nontidal wetlands and 238 stream segments were delineated within the Phase 1 South portion of the corridor study boundary. The wetlands features included 28 Palustrine Emergent wetlands, 37 Palustrine Forested wetlands, and 1 Palustrine Scrub-Shrub wetland. More detailed descriptions of wetland resources and impacts are included in the *Final Natural Resources Technical Report* (**FEIS, Appendix M**). The Preferred Alternative would have direct impacts on wetlands, affecting approximately 3.9 acres (**Table 3-12**).

The full ICE Analysis Area contains approximately 17,800 acres of wetlands according to National Wetlands Inventory (NWI) mapping.

a. Indirect Impacts

Indirect impacts to wetlands and waterways from Preferred Alternative could result from roadway runoff, sedimentation, and changes to hydrology. A detailed assessment of indirect hydrologic effects will occur once final amounts of cut and fill are determined in the final phase of engineering design.

Indirect impacts to wetlands could occur from increased demand for development due to improved access to employment and other land uses. Undeveloped areas in the ICE Analysis Area (primarily those located near Frederick, Maryland and northern Montgomery County) would be potentially susceptible to increased demand for conversion of land from rural to urban and suburban uses, potentially resulting in impacts to wetland areas. The degree to which this increased demand may occur cannot be quantified based on available information. This demand would be limited by existing local land use ordinances and guided by county comprehensive plans.

Any wetlands impacts associated with proposed public or private development would require permitting by the USACE and state regulatory agencies, as well as review and approval by county governments to ensure consistency with environmental protection guidelines.

All direct and indirect impacts would lead to a decrease in available wetland and waterway habitat within the study area and ultimately a decrease in plant and animal species inhabiting these areas. Impacts to wetland functions may include: losses of groundwater recharge/discharge, floodflow alteration, fish and shellfish habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, sediment/shoreline stabilization, wildlife habitat, recreation, educational/scientific value, uniqueness/heritage, visual quality/aesthetics, wildlife habitat, and endangered species habitat. Impacts to wetlands would be regulated by the USACE and the MDE. Indirect effects would be minimized by the required permitting process, which would identify avoidance, minimization, and mitigation as needed to offset wetland losses.

b. Cumulative Impacts

Past land use development and transportation projects have had impacts on wetlands, particularly those that occurred prior to the passage of state and federal laws that regulate wetland impacts. Since these laws were implemented, impacts to wetlands have largely been offset by required mitigation including

construction of new wetlands. The LULC data presented in **Table 3-3** above shows a relatively small decline in percentage of wetland acreage in the Maryland portion of the ICE Analysis Area between 2002 and 2010. However, much of the natural wetland acreage was likely lost prior to 1973 due to land development, agriculture, and transportation development.

Wetlands impacts associated with future proposed public or private development would require permitting by the USACE and state regulatory agencies, as well as review and approval by county governments to ensure consistency with environmental protection guidelines.

The Preferred Alternative would have direct impacts on wetlands, affecting approximately 3.9 acres (See **Table 3-12**). Direct impacts to wetlands would be regulated by the USACE and the MDE. Since the DEIS, considerable additional efforts to avoid and minimize impacts have been undertaken. For example, all noise barrier locations were reviewed and revised to avoid impacts to wetlands. The Preferred Alternative would thus contribute a relatively minor incremental effect towards the long-term trend of wetland loss, which has more recently slowed due to protective legislation. The incremental effect would be minimized by the required permitting process, which would identify avoidance, minimization, and mitigation as needed to offset wetland losses.

Based on the Preferred Alternative direct and indirect impacts, the current mitigation requirement estimate in Maryland includes 4.38 acres of wetland mitigation. Off-site compensatory nontidal wetlands and waterways mitigation in Maryland consists of two permittee-provided mitigation sites located in the Middle Potomac-Catoctin watershed, including a total of 4.61 acres of potential wetland mitigation credits. Current NPS wetland mitigation requirements include a total of 0.90 acre of NPS wetland mitigation. One mitigation site has been identified that includes approximately 1.49 acres of potential wetland mitigation. Additional detail is provided in **FEIS**, **Chapter 5** and the *Final Compensatory Wetlands and Waterways Mitigation Plan* (**FEIS, Appendix O**)

C. Floodplains

Floodplains provide numerous natural and beneficial functions including flood moderation; water impurity and sediment filtration; groundwater recharge; habitat for fish, terrestrial wildlife, and plants; outdoor recreation space; and open space for agriculture, aquaculture, and forestry (US Department of Transportation, 1979). Floodplains naturally and economically help to maintain water quality and reduce flood property damage by providing floodwater storage and decreasing water flow velocity and sedimentation. Floodplains also provide protected environments for plants to grow and for fish and other wildlife to breed and forage. In addition to the advantage of flood damage reduction, humans also benefit from floodplains through the agricultural and recreational space they provide (FEMA, 2018).

Floodplains within the corridor study boundary were identified using Maryland iMap and FEMA's Effective Floodplain GIS layer. Acreage of the 100-year floodplains within the limits of disturbance for the Preferred Alternative were calculated using GIS. No floodplain fieldwork was conducted. The Preferred Alternative would have direct impacts to 31.6 acres of 100-year floodplains (**Table 3-12**).

The full ICE Analysis Area contains approximately 30,400 acres of FEMA's 100-year floodplains according to FEMA National Flood Hazard Layer mapping.

a. Indirect Impacts

Disturbances in floodplains can reduce their capability to provide ecological services associated with flood control, maintenance of stream flow, stream bank and channel stabilization, and wildlife habitat. Loss of these services may result in increased flooding, erosion and sedimentation, and damage to channel morphology. Floodplain encroachment could alter the hydrology of the floodplain, which could indirectly result in more severe flooding in terms of flood height, duration, and erosion. Indirect impacts from the Preferred Alternative would be limited as they are confined to widening in existing corridors. Existing culverts would be extended or resized where appropriate, and bridges widened or replaced in accordance with design standards. Indirect impacts to floodplains would be minimized through adherence to existing regulatory requirements.

b. Cumulative Impacts

The Preferred Alternative would have direct impacts to 31.6 acres of 100-year floodplains (see **Table 3-12**). The impacts would result from widening of existing waterway crossings along I-495 and I-270. Construction of new roadway improvements across drainage ways and floodplains may create increases in floodplain elevation and size with potential for property damage and natural resource impacts. To ensure that floodwater impacts due to roadway construction are minimized, drainage structures are required to be designed to maintain the current flow regime and associated flooding. Flooding risks would be minimized since all culverts and bridges would be designed to limit the increase in the elevation of the regulatory flood so that structures will not be affected. Existing culverts, culvert extensions, and new culverts associated with these improvements would require hydraulic evaluations to verify potential impacts to flooding. The incremental impact of the Preferred Alternative to floodplains, considered in light of past, present and future impacts, is expected to be relatively minimal due to existing regulatory controls and regulations.

D. Forest

State-funded highway construction projects that involve cutting and clearing of forests are regulated under Maryland Reforestation Law (Natural Resources Article Section 5-103), a regulation created to protect Maryland forests and mitigate for the loss of forest cover. Forest impacts must be replaced on an acre-for-acre or one-to-one basis on public lands, within two years or three growing seasons of project completion (MDNR, 1997).

The Chesapeake Bay Land Cover GIS dataset was used to identify forested areas in the full ICE Analysis Area. Forest and shrub land cover accounts for approximately 49 percent of the ICE Analysis Area (or approximately 181,900 acres). The Preferred Alternative would have direct impacts to forest, affecting approximately 455.0 acres of forest canopy (**Table 3-12**).

a. Indirect Impacts

Indirect impacts to forests from the Preferred Alternative could result from roadway runoff, sedimentation, and the introduction of non-native plant species within disturbed areas. These indirect impacts could lead to terrestrial habitat degradation within the ICE Analysis Area, and ultimately a decrease in plant and animal species that inhabit these areas. Additionally, disturbance and land conversion along the edges of forest stands may facilitate immigration, establishment, and/or spread of invasive plant species over time. However, these indirect effects are expected to be relatively minor

because the improvements would occur along highly urbanized, established corridors that have very little undisturbed land along them, as confirmed by aerial imagery and plans.

Increased demand for land development resulting from greater access provided by the Preferred Alternative could result in pressure for conversion of forest land to residential or commercial use. State and local policies protecting forested land, and the effects of zoning and comprehensive planning to direct growth and protect natural resources, would help to offset such indirect effects. For example, the Montgomery County Forest Conservation Law regulates private developments in Montgomery County and may require property owners to prepare a forest conservation plan to receive development approval (Montgomery Planning, 2018).

b. Cumulative Impacts

Past development and transportation projects have had substantial impacts on forested land in the ICE Analysis Area. As shown in **Table 3-3** above, forested land in the ICE Analysis Area declined by over 12,400 acres between 1973 and 2010. This decline has likely been a direct result of the conversion of over 48,000 acres of land to residential and other developed land uses during that time frame. Impacts from the expansion of transportation facilities to accommodate a growing population has also had impacts on forests in the ICE Analysis Area.

Present and future development projects will likely continue to have impacts on forested land, but continued loss of forests as a result of non-transportation development would be regulated and minimized by the Maryland Forest Conservation Act of 1991 (FCA) and local environmental protection measures. The FCA requires the preparation of a forest conservation plan for projects of 40,000 square feet and larger. The FCA sets forth reforestation and afforestation threshold percentages for any land undergoing development, and also protects high priority forests, such as large contiguous stands and riparian forests. Potentially applicable local measures include the Montgomery County Forest Conservation Law.

The Preferred Alternative would have direct impacts to forest, affecting approximately 455.0 acres of forest canopy as shown in **Table 3-12.** Because the Preferred Alternative would improve existing roadways in a highly urbanized area, impacted forestland along the study corridor is primarily edge habitat. Forest land within the Preferred Alternative occurs predominantly as small strips along roadsides and interchanges and in residential and commercial areas, with larger tracts occurring within stream valleys and parkland. Individual forest stands in Montgomery County are typically smaller and more fragmented due to a higher level of development adjacent to I-495 and I-270.

The incremental effect of the Preferred Alternative on forested land in the ICE analysis area would be potentially substantial. While future development and transportation projects would be regulated in a manner that minimizes forest impacts, the past losses of forest in the ICE Analysis Area have been substantial. The Preferred Alternative would directly impact approximately 455.0 acres of forest canopy in the ICE Analysis Area, making the contribution of this single project relatively large compared to most other current or future projects. The required 1:1 mitigation will help offset the incremental effect of this impact; however, it may not be possible to find suitable replacement land within close proximity of the build corridors. Additionally, this may result in replacement of mature forest areas with new, smaller trees. Thus, while the overall cumulative loss would be offset by the required mitigation, the localized

forest loss in urbanized areas where forest cover has been depleted by other actions would result in a major incremental effect near the Preferred Alternative, particularly if suitable mitigation replacement areas cannot be located close to the affected areas.

E. Wildlife and Wildlife Habitat

Due to the broad use of available habitat by terrestrial and aquatic wildlife, numerous federal and state agencies may be involved in the regulation of proposed habitat impacts. Federal and state agencies regulate and manage activities associated with terrestrial and aquatic wildlife and their habitats on conserved lands and through the enforcement of laws related to hunting and fishing as well as threatened and endangered species. The United States Fish and Wildlife Service (USFWS), Virginia Department of Game and Inland Fisheries (VDGIF), and MDNR act as consulting agencies under the United States Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) and provide environmental analysis of projects or permit applications coordinated through federal and state agencies. Their role in these procedures is to determine likely impacts upon fish and wildlife resources and habitats, and to recommend appropriate measures to avoid, reduce, or compensate for those impacts. The *Final Natural Resources Technical Report* (**FEIS, Appendix M**) contains regulatory specifics pertaining to threatened and endangered species.

Larger, contiguous forested areas are important as Forest Interior Dwelling Species (FIDS) of birds depend on these areas to successfully breed and produce sustainable populations. In Maryland, potential FIDS habitat is defined as a contiguous forest area that is greater than 50 acres in size and contains at least 10 acres of forested interior greater than 300 feet from the nearest forest edge.

The Chesapeake Bay Land Cover dataset includes trees and shrubs, herbaceous land, water, barren land, and impervious surfaces. **Table 3-13** presents the land cover in the ICE Analysis Area.

Table 3-13: Land Cover in the ICE Analysis Area

Land Cover	Acres in ICE Analysis Area
Trees and Shrubs	181,900
Herbaceous	93,200
Water	8,700
Barren	1,200
Impervious	82,500
Total ICE Analysis Area	**367,500**

Source: Chesapeake Conservancy: Chesapeake Bay Land Cover 2016.
Note: values rounded to closest 100 acres.

a. Indirect Impacts

Habitat fragmentation is indirectly associated with habitat loss. Habitat fragmentation can have wide-ranging indirect effects to wildlife, resulting in species shifts associated with greater edge habitat and less interior habitat (smaller patch size); lower diversity due to smaller habitat patches; potential isolation of populations; increased vulnerability of species to external competition and predation; potential decreased flow of genetic material through the landscape; restricting wildlife movements that disrupt foraging, breeding/nesting and migration; increased risk of invasive species establishment; and generally, reduced biological diversity. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife

abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health.

Altering sunlight in riparian areas by removing forest canopy or shading with bridges and culverts can indirectly alter aquatic vegetation and wildlife community composition. This could occur by introducing invasive species and changes in light regime (more or less sunlight) which favor different types of plants and animals, as well as altering water chemistry that increases or decreases dissolved oxygen and temperature that can impact nutrient cycling and aquatic life. Moreover, widening of existing bridges and lengthening culverts under the Preferred Alternative could indirectly restrict wildlife movement through the riparian corridors crossed by these structures and alter up and downstream hydrologic flow. This could possibly impact aquatic vegetation, and breeding, nesting, and foraging habitat that can, in turn, increase wildlife vulnerability to predation and the health of aquatic life, ultimately impacting the ability of the ecosystem to maintain itself.

Because the Preferred Alternative would improve existing roadways in highly urbanized areas which are already highly fragmented and affected by the existing transportation facilities, the potential negative indirect effects to terrestrial and aquatic wildlife and wildlife habitat would be limited. Best management practices, such as state-of-the-art sediment and erosion control techniques and stormwater management controls, would further reduce the indirect downstream adverse effects of the Preferred Alternative to these resources. More information is included in the *Final Natural Resources Technical Report* (**FEIS, Appendix M**).

b. Cumulative Impacts

Past land development and transportation projects have had substantial impacts on wildlife habitat in the ICE Analysis area. As noted in **Section 3.2.3D** above, over 12,400 acres of forested land were converted to residential or other uses between 1973 and 2010. The 2016 land cover data shows that much of the developed portions of the ICE Analysis Area still contains tree and shrub cover. However, this tree and shrub cover is highly fragmented and interspersed with lawns and impervious surfaces. The 2016 land cover data also shows that impervious surfaces account for over 20 percent of the land cover in the ICE Analysis Area. Fragmented patches of tree and shrub cover in residential areas can function as wildlife habitat, but not to the same degree as intact contiguous forests.

Past projects have also had impacts to surface water, wetlands, floodplains, forest, and sensitive species in the ICE Analysis Area as discussed in **Section 3.2.3A, B, C, D, and F**. The major growth of population and land development in the ICE Analysis Area has thus had a substantial detrimental effect on wildlife habitat.

Planning and preservation efforts, such as the designation of stream valley parks as green infrastructure corridors, have been implemented to help reduce the effects of this growth and development. Continuing efforts to preserve intact quality habitat such as riparian corridors, park lands, sensitive areas, wetlands, waters and forests will help to minimize present and future impacts to wildlife habitat.

The Preferred Alternative would widen existing interstates in an area that is already highly urbanized, and much of the intact habitat is already designated for preservation. However, the Preferred Alternative would have impacts to unique and sensitive areas including targeted ecological areas; green infrastructure hubs and green corridors; rare, threatened and endangered species (RTE) habitat; wetlands and waters, and forest.

Table 3-12 presents the impacts to unique and sensitive areas, wetlands, waters, and forest. Areas with the most intact habitat in the study corridor include riparian corridors and park land.

Overall, the cumulative effects of transportation and development projects would be adverse to wildlife and wildlife habitat, but would be reduced by applicable federal, state, and local laws and regulations requiring potential adverse effects to be avoided, minimized, or mitigated. The Preferred Alternative would contribute incrementally to the overall cumulative effect on wildlife habitat, given the direct impacts to key resources such as targeted ecological areas, green infrastructure hubs, green corridors, RTE Species areas, and FIDS habitat.

F. Sensitive Species

State- and federally-listed threatened or endangered species were identified within the ICE Analysis Area through a review of the USFWS Information Planning and Consultation (IPaC), MDNR Wildlife and Heritage Service (MDNR-WHS), Virginia Fish and Wildlife Information Service, Virginia Department of Conservation and Recreation-Department of Natural Heritage (VDCR-DNH) databases, and the District's Wildlife Action Plan (2015). The review identified 187 state- and federally-listed threatened and endangered species potentially in the ICE Analysis Area (see **Appendix C**). Federally-designated critical habitat in the ICE Analysis Area is for the Atlantic Sturgeon in the Potomac River, with its northern extent at Little Falls Dam (NOAA, 2018).

Although bald eagles are no longer federally- or state-listed, the raptors currently are protected under the Bald and Golden Eagle Protection Act. Threats to the bald eagle include habitat destruction, electrocution, poisoning, wind farms, and pesticides.

Data obtained from the Mid-Atlantic Fishery Management Council and National Marine Fisheries Service Mid-Atlantic Region Habitat Conservation Division indicates that there is Essential Fish Habitat mapped for bluefish and summer flounder; this area is located in the Potomac River, from just north of the Montgomery County-DC border to the southern extent of the ICE Analysis Area in Alexandria. There is no Habitat Area of Particular Concern mapped in the ICE Analysis Area.

To assess the potential for the presence of Maryland state-listed terrestrial or aquatic RTE species within the I-495 & I-270 Managed Lanes Study corridor, the Maryland Trilogy Application was completed. This online application solicits state-listed RTE species review from the MDNR-WHS and MDNR Environmental Review Program. In addition, mapped MDNR Sensitive Species Project Review Areas were reviewed in Maryland to determine areas supporting or providing habitat buffers for RTE species within the Phase 1 South portion of the corridor study boundary. For Virginia state listed RTE species, the VDCR was contacted for information on the potential presence of RTE plant and insect species within the Phase 1 South portion of the corridor study boundary. To assess the potential presence of federally-listed RTE species under the jurisdiction of the USFWS, the IPaC tool was used. Response letters, online reviews, and other correspondence from the state and federal agencies responsible for RTE species are included in *Appendix N* of the *Final Natural Resources Technical Report* (**FEIS, Appendix M**).

No federal- or state-listed species are known to occur within the corridor study boundary. Within the Virginia portion of the I-495 & I-270 Managed Lanes Study corridor the federally-listed threatened northern long-eared bat (*Myotis septentrionalis*) was identified as potentially occurring within suitable

summer roosting forested habitat and the state-listed threatened wood turtle (*Glyptemys insculpta*) potentially within suitable riverine habitat in the Potomac River Gorge. In January 2021, a USFWS letter to FHWA stated that the project was "not likely to adversely affect" the northern long-eared bat. Additionally, surveys that were conducted in February and March of 2021 identified no wood turtles and only marginally-suitable habitat; the Virginia Department of Wildlife Resources (VDWR) determined that this project is not likely to result in significant adverse impacts to this species.

Within the Maryland portion of the study corridor, the MDNR identified several state-listed threatened or endangered plant species that may occur within scour bars or the adjacent floodplain of the Potomac River. A habitat assessment and targeted species survey was completed on federal lands within the C&O Canal National Historical Park in late June and July 2019 to determine whether suitable habitat for the state listed plant species exists. Further surveys were conducted in the same area and in the Potomac Gorge in Virginia during the spring and summer of 2020. Results of the targeted species surveys documented seven rare species on the Maryland side of the Potomac River and two on the Virginia side within the Preferred Alternative LOD. It was determined that six targeted plant species would be likely impacted by the Preferred Alternative.

The Preferred Alternative would directly impact 54.8 acres of RTE species habitat (**Table 3-12**).

a. Indirect Impacts

Loss of protected species' habitat and fragmentation of such habitat can indirectly affect protected and other wildlife species as described above. Endangered Species Act (ESA) Section 7 consultation regarding the Preferred Alternative's potential effects to federally-protected species has concluded, and potential impacts to state-listed threatened and endangered species are being coordinated. MDOT SHA has committed to coordinating with NPS and MDNR to develop a mitigation plan for RTE plant species prior to construction. No development or direct access to development is dependent upon implementing the Preferred Alternative, but increased demand for land use changes and potential human and natural environmental impacts related to such could result from the Preferred Alternative.

Approximately 18 Bald Eagle nests are in the ICE Analysis Area (Maryland Bird Conservation Partnership, 2021; Watts and Byrd, 2013). Construction and operation of transportation improvements and other development can indirectly cause abandonment of nest locations due to noise and increased human activity.

b. Cumulative Impacts

Past projects have had detrimental impacts on sensitive species, particularly development and transportation projects that occurred prior to the passage of the ESA in 1973 and the Maryland Nongame and Endangered Species Conservation Act in 1975. The overall impacts of past actions since 1970 have likely had effects on sensitive species due to the conversion of wildlife habitat to urbanized land uses.

Based on currently available information, impacts to RTE plant species are anticipated in the vicinity of the ALB. The Preferred Alternative would impact 54.8 acres of RTE species habitat, as shown in **Table 3-12**. Present and future development could potentially impact protected species, though such effects would likely be minimized by adherence to federal and state laws and regulations for protected species. The incremental effect of the Preferred Alternatives, in consideration of past, present, and future impacts to

RTE species habitat, is substantial. Habitat for RTE species has likely declined substantially as the ICE Analysis Area has become increasingly urbanized and developed, and the Preferred Alternative would require major incremental impact to RTE species habitat. Avoidance, minimization, and mitigation in consultation with agencies with jurisdiction would help to minimize the incremental effect of the Preferred Alternative on RTE species. More information on direct impacts to RTE species habitat and potential avoidance and mitigation measures is included in the *Final Natural Resources Technical Report* (**FEIS, Appendix M**).

3.2.4 Air Quality

Federal requirements for air quality analyses for transportation projects derive from NEPA and, where applicable, the federal transportation conformity rule (40 CFR Parts 51 and 93). NEPA guidance for air quality analyses for transportation projects may be found on or via the FHWA website for planning and the environment.

As required by the Clean Air Act, USEPA sets the National Ambient Air Quality Standards (NAAQS) for airborne pollutants that have adverse impacts on human health and the environment. The NAAQS are a set of baseline standards over which state governments can choose to impose stricter standards.

The project is currently included in the NCRTPB FY 2019 – 2024 Transportation Improvement Program (TIP) [TIP ID 6432 and Agency ID AW0731 (planning activities)] and the NCRTPB *Visualize 2045 Long-Range Plan* (CEID 1182, CEID 3281, and Appendix B page 56). This project is included in the Air Quality Conformity Analysis that accompanies the *Visualize 2045* Plan. The NCRTPB is currently updating the *Visualize 2045* plan, to be completed in 2022. The design concept and scope for the Preferred Alternative, which is not significantly different than that included in the current version of *Visualize 2045*, will be included in the Air Quality Conformity Determination accompanying the update to *Visualize 2045* which will be approved in 2022.

Montgomery County and Fairfax County were previously designated as maintenance areas for the Particulate Matter $(PM)_{2.5}$ 1997 primary annual standard, but the USEPA has revoked that NAAQS. Therefore, transportation conformity requirements no longer apply for the fine particulate matter ($PM_{2.5}$) standard and no analysis is necessary. Additionally, the Study is located in a region where the maintenance period for CO has expired and transportation conformity no longer applies. However, CO is highlighted in the FHWA 1987 guidance as a transportation pollutant to be summarized in an EIS, therefore, an updated traffic analysis to determine the worst-case intersections and interchanges for the Preferred Alternative was performed. For additional details, refer to the *Final Air Quality Technical Report* (**FEIS, Appendix K**)

A. Indirect Impacts

The quantitative assessment conducted for project-specific carbon monoxide (CO), quantitative analysis for mobile source air toxics (MSAT) impacts, and the regional conformity analysis conducted for ozone (NCRTPB) can be considered indirect effects analyses because they look at air quality impacts attributable to the project that occur in the future. These analyses demonstrate that, in the future 1) air quality impacts from CO will not cause or contribute to violations of the CO NAAQS, 2) MSAT emissions will be significantly lower than they are today when compared to the No Build condition for 2025 and 2045, and 3) the mobile source emissions budgets established for the region for purposes of meeting the ozone NAAQS will not be exceeded. Therefore, the indirect effects of the project are not expected be significant.

B. Cumulative Impacts

The annual conformity analysis conducted by the NCRTPB represents a cumulative impact assessment for purposes of regional air quality because it assesses the incremental effect of the project in light of reasonably foreseeable future projects and effects of past and present projects. Federal conformity requirements, including specifically 40 CFR 93.114 and 40 CFR 93.115, apply as the area in which the project is located is designated as nonattainment for ozone. Accordingly, there must be a currently conforming transportation plan and program at the time of project approval, and the project must come from a conforming plan and program (or otherwise meet criteria specified in 40 CR 93.109(b)).

- The existing air quality designations for the region are based, in part, on the accumulated mobile source emissions from past and present actions, and these pollutants serve as a baseline for the current conformity analysis.
- The conformity analysis quantifies the amount of mobile source emissions for which the area is designated nonattainment/maintenance that will result from the implementation of all reasonably foreseeable regionally significant transportation projects in the region (i.e., those proposed for construction funding over the life of the region's transportation plan).
- The most recent conformity analysis was completed in October 2018, with FHWA and Federal Transit Administration issuing a conformity finding on October 17, 2018 for the TIP and CLRP covered by that analysis. This analysis demonstrates that the incremental impact of the proposed project on mobile source emissions, when added to the emissions from other past, present, and reasonably foreseeable future actions, as reflected in the transportation plan and TIP conformity determinations, will not cause or contribute to a new violation, increase the frequency or severity of any violation, or delay timely attainment of the NAAQS established by USEPA.

Regarding greenhouse gas (GHG) emissions, statewide analyses indicate that the HOT lanes will not impede Maryland's ability to meet its GHG emission reduction goals. According to the Greenhouse Gas Reduction Act Plan, including this project, Maryland is expected to exceed its 40% reduction by 2030 goal and strive for a 50% reduction by 2030.

Therefore, the cumulative impacts of the study are expected to be minimal.

3.3 Summary and Conclusions

The Preferred Alternative would have direct impacts to socioeconomic, cultural, and natural resources. These would include direct impacts to communities, parks, historic resources, wetlands and waterways, floodplains, and forested land.

Existing land use in the ICE Analysis Area includes a mix of developed residential, commercial, and institutional land uses, along with open spaces, forested areas, and relatively small areas of farmland. County and local master plans focus on protecting existing open space and residential communities by directing future development to designated areas. There are no planned developments in the ICE Analysis Area that are dependent upon the completion of the Preferred Alternative.

Potential for indirect effects from the Preferred Alternative would be primarily related to a potential increase in demand for land use development resulting from improved access along the I-270 and I-495 corridors. More rural, less developed portions of the ICE Analysis Area such as northern Montgomery

County and southern Frederick County near I-270, and other locations where undeveloped land exists would be most likely to experience pressure for new development. Induced growth, potentially resulting from greater accessibility along I-270 and I-495, could in turn lead to effects on socioeconomic, cultural, and natural resources in the ICE Analysis Area.

The Preferred Alternative would improve existing highly urbanized major roadway corridors and would not create facilities along new alignment. Substantial population growth and land development has occurred in the ICE Analysis Area during the analysis time frame, and the project needs have arisen as a result of this growth. The Preferred Alternative would provide new capacity and managed lanes strategies to reduce the already high levels of congestion in the study area. Indirect impacts would be minimized by existing master plans and zoning regulations pertaining to new development.

There would be potential for indirect impacts to downstream water quality, wetlands, and wildlife habitat as a result of increased impervious surface and temporary construction impacts that could potentially increase sediment and pollutant-loaded runoff. The increase in impervious surface could indirectly impact floodplains and waterways by causing excess erosion or sedimentation. Erosion and sediment controls and permitting requirements would minimize increases in sediment and runoff resulting from the Preferred Alternative, as well as any other new developments occurring in the ICE Analysis Area.

Past developments and transportation projects have had substantial impacts on socioeconomic, cultural, and natural resources in the ICE Analysis Area. Major growth in employment and population in the ICE Analysis Area since 1970 has resulted in conversion of natural land and wildlife habitat into urbanized land uses. Infrastructure has been continually expanded to accommodate the growing population and economy.

Reasonably foreseeable present and future projects will likely continue to impact socioeconomic, cultural, and natural resources in the ICE Analysis Area. However, present and future impacts are likely to be lower due to the combined effects of laws and regulations that protect resources such as wetlands, waterways, RTE species, forest, historic architecture, and others.

The incremental effects of the Preferred Alternative, considered in light of the past, present and future actions impacting the environment will likely occur. The Preferred Alternative is comprised of large-scale improvements to high volume, regionally important roadway facilities. As such, the incremental effect of the Preferred Alternative would be substantial in consideration of the numerous other impacts on resources in the ICE Analysis Area. Resources such as cultural resources, forests, and parklands, which would have substantial impacts in locations where proximal replacement of the resources may not be possible, are likely to result in the greatest incremental effects.

Cumulative impacts to water quality could occur from stream loss and the incremental increase of impervious surfaces that may increase runoff from past, present, and future development projects. These would be minimized through the use of BMPs during construction and use of stormwater management facilities. Federal, state and local laws controlling future development and requiring forest conservation and mitigation/reforestation would minimize the potential for cumulative impacts to forest and terrestrial habitat.

Indirect and cumulative impacts to air quality from the Preferred Alternative would not cause or contribute to any violation of NAAQS. Furthermore, the Preferred Alternative is accounted for in the annual conformity analysis conducted by the NCRTPB, which represents a cumulative impact assessment for purposes of regional air quality. Therefore, no substantial indirect or cumulative effects to air quality are anticipated from the Preferred Alternative.

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APPENDIX A: ICE Analysis Area Census Tracts and Population

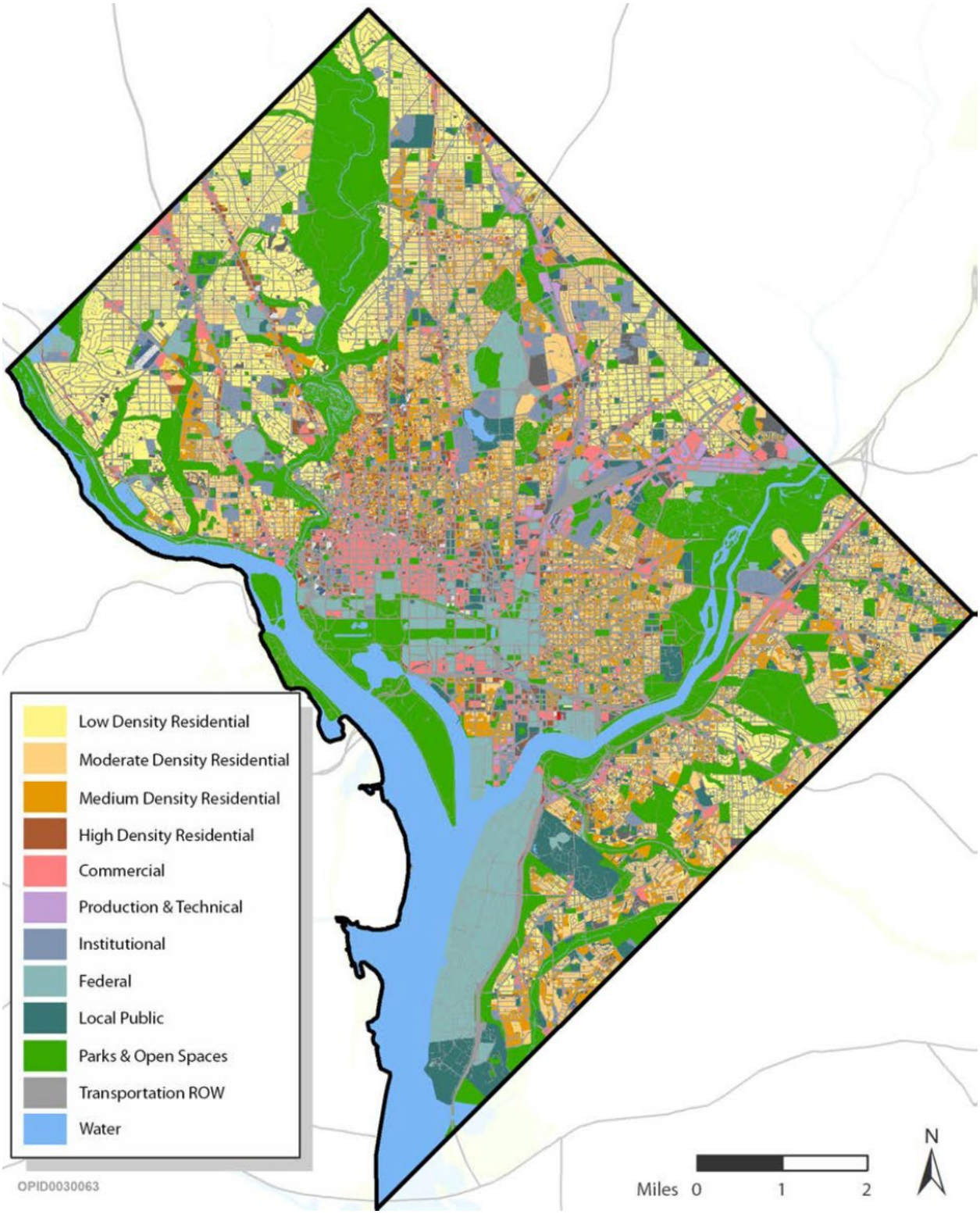
ICE ANALYSIS AREA CENSUS TRACTS AND POPULATION

Census Tracts	Total Population
Census Tract 7007.17, Montgomery County, Maryland	7,424
Census Tract 7007.18, Montgomery County, Maryland	6,170
Census Tract 7008.16, Montgomery County, Maryland	8,249
Census Tract 7008.17, Montgomery County, Maryland	7,808
Census Tract 7010.01, Montgomery County, Maryland	5,700
Census Tract 7010.02, Montgomery County, Maryland	3,945
Census Tract 7010.04, Montgomery County, Maryland	6,018
Census Tract 7010.05, Montgomery County, Maryland	3,339
Census Tract 7010.06, Montgomery County, Maryland	5,456
Census Tract 7010.07, Montgomery County, Maryland	3,327
Census Tract 7012.05, Montgomery County, Maryland	7,102
Census Tract 7012.06, Montgomery County, Maryland	6,298
Census Tract 7012.11, Montgomery County, Maryland	6,796
Census Tract 7012.15, Montgomery County, Maryland	5,703
Census Tract 7044.01, Montgomery County, Maryland	3,289
Census Tract 7045.02, Montgomery County, Maryland	2,546
Census Tract 7058, Montgomery County, Maryland	6,351
Census Tract 7059.01, Montgomery County, Maryland	4,473
Census Tract 7059.02, Montgomery County, Maryland	4,269
Census Tract 7060.08, Montgomery County, Maryland	5,305
Census Tract 7060.09, Montgomery County, Maryland	5,590
Census Tract 7060.12, Montgomery County, Maryland	3,259
Census Tract 7060.13, Montgomery County, Maryland	2,889
Census Tract 4701, Fairfax County, Virginia	2,560
Census Tract 4801, Fairfax County, Virginia	3,995
TOTAL ICE Analysis Area Census Tracts	127,861

Source: US Census ACS 5-Year Estimates, 2015-2019

APPENDIX B: DC Existing Land Use Map, 2017

EXISTING LAND USE IN THE DISTRICT OF COLUMBIA, 2017



Source: Approved Comprehensive Plan Update, DC Office of Planning, 2021,
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APPENDIX C: Threatened and Endangered (T&E) Species List

THREATENED AND ENDANGERED (T&E) SPECIES LIST

Species	Status	Listing Source
Atlantic Sturgeon (*Acipenser oxyrinchus*)	FE, SE	VAFWIS, USFWS-IPaC (District)
Shortnose Sturgeon (*Acipenser brevirostrum*)	FE	NOAA Fisheries (District)
Dwarf Wedgemussel (*Alasmidonta heterodon*)	FE, SE	USFWS-IPaC, MDNR (DC, Montgomery)
Indiana Bat (*Myotis sodalis)*	FT	USFWS-IPaC (Frederick)
Hay's Spring Amphipod (*Stygobromus hayi*)	FE	USFWS-IPaC (District)
Yellow Lance (*Elliptio lanceolate*)	FT	USFWS-IPaC (Fairfax, Montgomery)
Northern Long-eared Bat (*Myotis septentrionalis*)	FT, ST	USFWS-IPaC, VAFWIS (Fairfax)
Small Whorled Pogonia (*Isotria medeoloides*)	FT	USFWS-IPaC, MDNR (Montgomery, Fairfax)
Tall Dock (*Rumex latissimus*)	SE	MDNR (Frederick, Montgomery)
Climbing Milkweed (*Matelea obliqua*)	SE	MDNR (Frederick, Montgomery)
Blue Wild Indigo (*Baptisia australis*)	ST	MDNR (Montgomery)
Tall Tickseed (*Coreopsis tripteris*)	SE	MDNR (Montgomery)
Buttercup Scorpionweed (*Phacelia covellei*)	SE	MDNR (Montgomery)
Long's Rush (*Juncus longyi*)	SE	MDNR (Montgomery)
Long-stalk Greenbrier (*Smilax pseudochina*)	ST	MDNR (Montgomery)
American Brook Lamprey (*Lethenteron appendix*)	ST	MDNR (Montgomery)
Trailing Stitchwort (*Stellaria alsine*)	SE	MDNR (Montgomery)
Glassy Darter (*Etheostoma vitreum*)	ST	MDNR (Montgomery)
Triangle Floater (*Alasmidonta undulata)*	SE	MDNR (Frederick, Montgomery)
Green Floater (*Lasmigona subviridis*)	SE	MDNR (Frederick, Montgomery)
Upland Sandpiper (*Bartramia longicauda)*	SE	MDNR (Frederick, Montgomery)
Vandel's Cave Isopod *(Caecidotea vandeli)*	SE	MDNR (Frederick, Montgomery)

Species	Status	Listing Source
Northern Barrens Tiger Beetle *(Cicindela patruela)*	SE	MDNR (Frederick)
Elfin Skimmer *(Nannothemis bella)*	SE	MDNR (Frederick)
Allegheny Woodrat (*Neotoma magister*)	SE	MDNR (Frederick, Montgomery)
Edwards' Hairstreak *(Satyrium edwardsii)*	SE	MDNR (Frederick)
Appalachian Bewick's Wren *(Thryomanes bewickii altus)*	SX	MDNR (Frederick)
Climbing Fumitory *(Adlumia fungosa)*	ST	MDNR (Frederick)
Earleaf False Foxglove *(Agalinis auriculate)*	SE	MDNR (Frederick, Montgomery)
Purple Giant-hyssop *(Agastache scrophulariifolia)*	ST	MDNR (Frederick)
Red Milkweed *(Asclepias rubra)*	SE	MDNR (Frederick)
Lobed Spleenwort *(Asplenium pinnatifidum)*	SE	MDNR (Frederick, Montgomery)
Canadian Milkvetch *(Astragalus canadensis)*	SE	MDNR (Frederick, Montgomery)
Least Grapefern *(Botrychium simplex)*	SX	MDNR (Frederick, Montgomery)
Tuberous Grass-pink *(Calopogon tuberosus)*	SE	MDNR (Frederick)
Field Sedge *(Carex conoidea)*	SE	MDNR (Frederick)
Davis' Sedge *(Carex davisii)*	SE	MDNR (Frederick, Montgomery)
Short's Sedge *(Carex shortiana)*	SE	MDNR (Frederick, Montgomery)
Scarlet Indian-paintbrush (Castilleja coccinea)	SE	MDNR (Frederick)
Red Turtlehead *(Chelone obliqua)*	ST	MDNR (Frederick)
Goldthread *(Coptis trifolia)*	SE	MDNR (Frederick)
Spring Coralroot *(Corallorhiza wisteriana)*	SE	MDNR (Frederick, Montgomery)
Roundleaf Dogwood *(Cornus rugosa)*	SE	MDNR (Frederick)
Long-bract Green Orchis *(Dactylorhiza viridis)*	SE	MDNR (Frederick)
Bicknell's Witchgrass *(Dichanthelium bicknellii)*	SX	MDNR (Frederick, Montgomery)
Eastern Leatherwood *(Dirca palustris)*	ST	MDNR (Frederick, Montgomery)

Species	Status	Listing Source
Woodland Horsetail *(Equisetum sylvaticum)*	SE	MDNR (Frederick)
White Trout Lily *(Erythronium albidum)*	ST	MDNR (Frederick, Montgomery)
Glade Spurge *(Euphorbia purpurea)*	SE	MDNR (Frederick)
Rough Wood Aster *(Eurybia radula)*	SE	MDNR (Frederick, Montgomery)
Spotted Joe-pye Weed *(Eutrochium maculatum)*	SX	MDNR (Frederick)
Queen-of-the-prairie *(Filipendula rubra)*	SE	MDNR (Frederick)
Fringe-top Bottle Gentian *(Gentiana andrewsii)*	ST	MDNR (Frederick, Montgomery)
Sharp-scaled Mannagrass *(Glyceria acutiflora)*	SE	MDNR (Frederick)
Northern Oak Fern *(Gymnocarpium dryopteris)*	SE	MDNR (Frederick)
Golden-seal *(Hydrastis canadensis)*	ST	MDNR (Frederick, Montgomery)
Winged Loosestrife *(Lythrum alatum)*	SE	MDNR (Frederick, Montgomery)
Starflower Solomon's-plume *(Maianthemum stellatum)*	SE	MDNR (Frederick, Montgomery)
Climbing Milkweed *(Matelea obliqua)*	SE	MDNR (Frederick, Montgomery)
Appalachian Sandwort *(Minuartia glabra)*	SE	MDNR (Frederick)
Glade Mallow *(Napaea dioica)*	SE	MDNR (Frederick)
Little Floatingheart *(Nymphoides cordata)*	SE	MDNR (Frederick)
One-side Wintergreen *(Orthilia secunda)*	SX	MDNR (Frederick, Montgomery)
Black-fruit Mountain-ricegrass *(Patis racemosa)*	ST	MDNR (Frederick)
Smooth Cliffbrake *(Pellaea glabella)*	E	MDNR (Frederick, Montgomery)
Yellow Fringed Orchid *(Platanthera ciliaris)*	ST	MDNR (Frederick)
Large Purple Fringed Orchid *(Platanthera grandiflora)*	ST	MDNR (Frederick)
Purple Fringeless Orchid *(Platanthera peramoena)*	ST	MDNR (Frederick, Montgomery)
Small Purple Fringed Orchid *(Platanthera psycodes)*	SX	MDNR (Frederick, Montgomery)
Southern Mountainmint *(Pycnanthemum pycnanthemoides)*	SX	MDNR (Frederick)

Species	Status	Listing Source
Torrey's Mountainmint *(Pycnanthemum torreyi)*	SE	MDNR (Frederick, Montgomery)
Whorled Mountainmint *(Pycnanthemum verticillatum)*	SE	MDNR (Frederick, Montgomery)
Shumard Oak *(Quercus shumardii)*	ST	MDNR (Frederick, Montgomery)
Carolina Buttercup *(Ranunculus carolinianus)*	SX	MDNR (Frederick)
Yellow Water Crowfoot *(Ranunculus flabellaris)*	SE	MDNR (Frederick, Montgomery)
Wild Black Currant *(Ribes americanum)*	SX	MDNR (Frederick)
Tall Dock *(Rumex altissimus)*	SE	MDNR (Frederick, Montgomery)
Sessile-fruit Arrowhead *(Sagittaria rigida)*	SE	MDNR (Frederick, Montgomery)
Narrowleaf Willow *(Salix exigua)*	SE	MDNR (Frederick, Montgomery)
Canada Burnet *(Sanguisorba canadensis)*	ST	MDNR (Frederick, Montgomery)
Northern Pitcherplant *(Sarracenia purpurea)*	ST	MDNR (Frederick)
Blunt-lobe Grapefern *(Sceptridium oneidense [?])*	SE	MDNR (Frederick)
Water Bulrush *(Schoenoplectus subterminalis)*	SE	MDNR (Frederick)
Shale Barren Skullcap *(Scutellaria leonardii [h])*	ST	MDNR (Frederick, Montgomery)
Veined Skullcap *(Scutellaria nervosa)*	SE	MDNR (Frederick, Montgomery)
Rock Skullcap *(Scutellaria saxatilis)*	SE	MDNR (Frederick, Montgomery)
Sweet-scented Indian-plantain *(Senecio suaveolens)*	SE	MDNR (Frederick, Montgomery)
Snowy Campion *(Silene nivea)*	SE	MDNR (Frederick, Montgomery)
Prairie Goldenrod *(Solidago rigida)*	SX	MDNR (Frederick, Montgomery)
Yellow Nodding Ladies'-tresses *(Spiranthes ochroleuca)*	SE	MDNR (Frederick, Montgomery)
Eastern Featherbells *(Stenanthium gramineum)*	ST	MDNR (Frederick, Montgomery)
Purple Meadow Parsnip *(Thaspium trifoliatum)*	SE	MDNR (Frederick)
Yellowleaf Tinker's-weed *(Triosteum angustifolium)*	SE	MDNR (Frederick, Montgomery)
Valerian *(Valeriana pauciflora)*	SE	MDNR (Frederick, Montgomery)

Species	Status	Listing Source
Navel-shaped Corn-salad *(Valerianella umbilicata)*	SX	MDNR (Frederick, Montgomery)
Broadleaf Bunchflower *(Veratrum hybridum)*	SE	MDNR (Frederick, Montgomery)
Marsh Speedwell *(Veronica scutellata)*	SE	MDNR (Frederick, Montgomery)
Northern Prickly-ash *(Zanthoxylum americanum)*	SE	MDNR (Frederick, Montgomery)
Golden-banded Skipper (Autochton cellus)	SX	MDNR (Montgomery)
American Bittern *(Botaurus lentiginosus)*	ST	MDNR (Montgomery)
Sedge Wren *(Cistothorus platensis)*	SE	MDNR (Montgomery)
Six-banded Longhorn Beetle *(Dryobius sexnotatus)*	SE	MDNR (Montgomery)
Rainbow Snake *(Farancia erytrogramma)*	SE	MDNR (Montgomery)
Skillet Clubtail *(Gomphus ventricosus)*	SX	MDNR (Montgomery)
Eastern Small-footed Myotis *(Myotis leibii)*	SE	MDNR (Montgomery)
Chesapeake Logperch *(Percina bimaculate)*	ST	MDNR (Montgomery)
Trout-perch *(Percopsis omiscomaycus)*	SX	MDNR (Montgomery)
Bachman's Sparrow *(Peucaea aestivalis)*	SX	MDNR (Montgomery)
Tawny Crescent *(Phyciodes batesii)*	SX	MDNR (Montgomery)
Regal Fritillary *(Speyeria Idalia)*	SX	MDNR (Montgomery)
Rock Creek Groundwater Amphipod *(Stygobromus kenki)*	SE	MDNR (Montgomery)
Ten-lobe False Foxglove *(Agalinis obtusifolia)*	SX	MDNR (Montgomery)
Thread-leaved Gerardia *(Agalinis setacea)*	SE	MDNR (Montgomery)
Nantucket Shadbush *(Amelanchier nantucketensis)*	ST	MDNR (Montgomery)
Woolly Three-awn *(Aristida lanosa)*	SE	MDNR (Montgomery)
Lake-cress *(Armoracia lacustris)*	SE	MDNR (Montgomery)
Leopard's-bane *(Arnica acaulis)*	SE	MDNR (Montgomery)
Great Indian-plantain *(Arnoglossum reniforme)*	SX	MDNR (Montgomery)

Species	Status	Listing Source
Ozark Milkvetch *(Astragalus distortus)*	ST	MDNR (Montgomery)
Broad-glumed Brome *(Bromus latiglumis)*	SE	MDNR (Montgomery)
Bluehearts *(Buchnera americana)*	SX	MDNR (Montgomery)
Buxbaum's Sedge *(Carex buxbaumii)*	SX	MDNR (Montgomery)
Carey's Sedge *(Carex careyana)*	SE	MDNR (Montgomery)
Cypress-knee Sedge *(Carex decomposita)*	SE	MDNR (Montgomery)
Hitchcock's Sedge *(Carex hitchcockiana)*	SE	MDNR (Montgomery)
Porcupine Sedge *(Carex hystericina)*	SE	MDNR (Montgomery)
Mead's Sedge *(Carex meadii)*	SE	MDNR (Montgomery)
Big Shellbark Hickory *(Carya laciniosa)*	SE	MDNR (Montgomery)
Prickly Hornwort *(Ceratophyllum echinatum)*	SE	MDNR (Montgomery)
Curly-heads *(Clematis ochroleuca)*	SX	MDNR (Montgomery)
Hazel Dodder *(Cuscuta coryli)*	SX	MDNR (Montgomery)
Smartweed Dodder *(Cuscuta polygonorum)*	SE	MDNR (Montgomery)
Glade Fern *(Homalosorus pycnocarpos)*	ST	MDNR (Montgomery)
Featherfoil *(Hottonia inflata)*	SE	MDNR (Montgomery)
Eastern Bloodleaf *(Iresine rhizomatosa)*	SE	MDNR (Montgomery)
Dwarf Crested Iris *(Iris cristata)*	SE	MDNR (Montgomery)
Hairy Lettuce *(Lactuca hirsuta)*	SX	MDNR (Montgomery)
Vetchling Peavine *(Lathyrus palustris)*	SE	MDNR (Montgomery)
Dwarf Bulrush *(Lipocarpha micrantha)*	SE	MDNR (Montgomery)
American Gromwell *(Lithospermum latifolium)*	SE	MDNR (Montgomery)
Virginia False Gromwell *(Lithospermum virginianum)*	SE	MDNR (Montgomery)
Climbing Fern *(Lygodium palmatum)*	ST	MDNR (Montgomery)
Lowland Loosestrife *(Lysimachia hybrida)*	ST	MDNR (Montgomery)

Species	Status	Listing Source
Carolina Anglepod *(Matelea carolinensis)*	SE	MDNR (Montgomery)
Purple Mecardonia *(Mecardonia acuminate)*	SE	MDNR (Montgomery)
Hair-awn Muhly *(Muhlenbergia capillaris)*	SE	MDNR (Montgomery)
Wiry Witch Grass *(Panicum flexile)*	SE	MDNR (Montgomery)
Yellow Nailwort *(Paronychia virginica var.Virginica)*	SE	MDNR (Montgomery)
Horse-tail Paspalum *(Paspalum fluitans)*	SE	MDNR (Montgomery)
Roundleaf Fameflower *(Phemeranthus teretifolius)*	ST	MDNR (Montgomery)
Smooth Phlox *(Phlox glaberrima)*	SE	MDNR (Montgomery)
Downy Phlox *(Phlox pilosa)*	SE	MDNR (Montgomery)
Racemed Milkwort *(Polygala polygama)*	ST	MDNR (Montgomery)
Seneca Snakeroot *(Polygala senega)*	ST	MDNR (Montgomery)
Leafy Pondweed *(Potamogeton foliosus)*	SE	MDNR (Montgomery)
Flatstem Pondweed *(Potamogeton zosteriformis)*	SE	MDNR (Montgomery)
Green-flower Wintergreen *(Pyrola chlorantha)*	SX	MDNR (Montgomery)
Water-plantain Spearwort *(Ranunculus ambigens)*	SX	MDNR (Montgomery)
Hairy Wild Petunia *(Ruellia humilis)*	SE	MDNR (Montgomery)
Pursh's Wild Petunia *(Ruellia purshiana)*	SE	MDNR (Montgomery)
Engelmann's Arrowhead *(Sagittaria engelmanniana)*	ST	MDNR (Montgomery)
Smith's Bulrush *(Schoenoplectus smithii)*	SX	MDNR (Montgomery)
Virginia Mallow *(Sida hermaphrodita)*	SE	MDNR (Montgomery)
Racemose Goldenrod *(Solidago racemose)*	ST	MDNR (Montgomery)
Rock Goldenrod *(Solidago rupestris)*	SX	MDNR (Montgomery)
Smooth False Buttonweed *(Spermacoce glabra)*	SE	MDNR (Montgomery)
Swamp Wedgescale *(Sphenopholis pensylvanica)*	ST	MDNR (Montgomery)
Shining Ladies'-tresses *(Spiranthes lucida)*	SE	MDNR (Montgomery)

Species	Status	Listing Source
Gritty Hedge-nettle *(Stachys aspera)*	SE	MDNR (Montgomery)
Bog Fern *(Thelypteris simulata)*	ST	MDNR (Montgomery)
Climbing Dogbane *(Thyrsanthella difformis)*	SE	MDNR (Montgomery)
Coastal False Asphodel *(Triantha racemosa)*	SX	MDNR (Montgomery)
Buffalo Clover *(Trifolium reflexum)*	SX	MDNR (Montgomery)
Nodding Pogonia *(Triphora trianthophoros)*	SE	MDNR (Montgomery)
Goosefoot Corn-salad *(Valerianella chenopodiifolia)*	SE	MDNR (Montgomery)
Appalachian Springsnail (*Fontigens bottimeri*)	SE	VDCR-DNH (Fairfax)
Little Brown Bat (*Myotis lucifugus lucifugus*)	SE	VAFWIS (Fairfax)
Tri-colored Bat (*Permyotis subflavus*)	SE	VAFWIS (Fairfax)
Brook Floater (*Alasmidonta varicosa*)	SE	VAFWIS, MDNR (Fairfax, Frederick, Montgomery)
Rustypatch Bumblebee (*Bombus* (*Bombus*) *affinus*)	SE	VDCR-DNH (Fairfax)
Wood Turtle (*Glyptemys insculpta*)	ST	VAFWIS, VDCR-DNH (Fairfax)
Peregrine Falcon (*Falco peregrinus*)	ST	VAFWIS (Fairfax)
Loggerhead Shrike (*Lanius ludovicianus)*	ST, SE	VAFWIS, MDNR (Fairfax, Frederick, Montgomery County)
Henslow's Sparrow (*Ammodramus henslowii*)	ST	VAFWIS (Fairfax)
Appalachian Grizzled Skipper (*Pyrgus wyandot*)	ST	VAFWIS (Fairfax)
Migrant Loggerhead Shrike (*Lanius ludovicianus migrans*)	ST	VAFWIS (Fairfax)

Status Codes:

- **E:** Endangered
- **FT**: Federally Threatened
- **ST**: State Threatened
- **SE**: State Endangered
- **FE**: Federally Endangered
- **SX**: Presumed Extirpated