II. Affected Environment – A
3. Community Profiles of the Master Plan Areas

information was distributed to nearly 100 participants and the Lead Agencies' representatives answered numerous questions focusing on potential for impacts and the project schedule.

3. Community Profiles of the Master Plan Areas

Profiles of the master plan areas within the study area are provided below. The neighborhoods were generally defined by social interactions, the common use of local facilities, participation in local organizations, residents' perceptions, and physical barriers, and may include multiple subdivisions.

a. Gaithersburg Vicinity/Shady Grove Sector

The Gaithersburg Vicinity is centrally located in Montgomery County in the westernmost portion of the study area (***Figure II-4, Sheets 3 and 6***). The area is approximately 15,000 acres, or 23.4 square miles, in size. Neighborhoods located in the Shady Grove Sector of this Master Plan area include Derwood, Washington Grove, Walnut Hill, Walnut Grove, Oakmont Manor, Shady Grove, Parkside Estates, Forest Oak, and Founder's Mill. These neighborhoods provide a variety of housing options of varying types, sizes, and densities. According to the *Shady Grove Sector 2004 Planning Board Draft*, 58 percent of the housing units in this area are single-family residences, 32 percent are townhouses, and ten percent are multi-family units. The majority of these communities have access to Shady Grove Road, and the commercial and business areas are concentrated along portions of Shady Grove Road. A popular shopping center for these communities is the Grove Shopping Center, located at the intersection of Shady Grove Road and Crabbs Branch Way. Public transportation, including the Shady Grove Metrorail Station and Maryland Rail Commuter (MARC) station at Metropolitan Grove, is in close proximity to a number of these communities.

The *Gaithersburg Vicinity Master Plan* manages and directs the dynamic growth potential of the Gaithersburg Vicinity Master Plan area. Even as of 1985, most of the land in Gaithersburg had already been either developed or committed to development under existing master plan guidelines of the City of Gaithersburg and of Montgomery County.

The Shady Grove Sector Plan retains the previous plan's recommendations for ICC right-of-way (ROW) and number of lanes. The community of Mill Creek was developed on both sides of the reserved ICC ROW, Founders Mill was developed on the north side, and Redland Station and Parkside Estates were developed on the south side of the ROW. Many of the residents with homes on Amity Terrace, Epsilon Drive, Polara Place, and Briardale Road west of Shady Grove Road, and many of the residents with homes on Tupelo Drive and others within Mill Creek South currently have a view of the forested ICC reserved ROW. Others in Founders Mill and Parkside Estates currently have a view of the Mill Creek Stream Valley Park.

b. Upper Rock Creek

The Upper Rock Creek area lies in the east-central part of Montgomery County (***Figure II-4, Sheets 3 and 6***). The area is approximately 18,880 acres, or 29.5 square miles, in size. The Upper Rock Creek area is adjacent to the City of Rockville to the south, Olney to the north and east, the Gaithersburg Vicinity area to the west, and the Town of Laytonsville to the north. Two major stream systems run generally north and south within the watershed: the mainstem of Rock Creek (and its tributaries in the west) and North Branch (and its tributaries to the east). About 60

percent of the Upper Rock Creek watershed lies in this Master Plan area. Almost one-quarter (more than 4,000 acres) of the Upper Rock Creek watershed is parkland.

The neighborhoods of Muncaster Mill View, Muncaster Manor, Bowie Mill Estates, Rolling Knolls, Granby Woods, Redland, Cashell Estates, Winters Run, and Magruder's Hazard, are within the Upper Rock Creek area. The majority of these communities are single-family homes that have established community associations. Commercial development in this area is concentrated near the Redland Road/Muncaster Mill Road intersection.

The *Upper Rock Creek Area Master Plan* includes measures to protect the natural environment, preserve residential character, and provide for the transportation and community needs. The Master Plan sees to protect environmental resources and maintain stream quality by keeping streams, forests, and wetlands in a natural state. The Plan's concept builds on and extends the Upper Rock Creek watershed's open space heritage.

Of equal importance to the Plan is preserving residential character. The generally low-density development of the Upper Rock Creek watershed is in keeping with the "On Wedges and Corridors" concept of the *General Plan* for Montgomery and Prince George's Counties, *On Wedges and Corridors, a General Plan for the Maryland Washington Regional District* (M NCPPC, 1964) (hereafter called the 1964 *General Plan*). Much of the watershed is in the Residential Wedge, an area envisioned by the 1964 *General Plan* as maintaining low densities and large lots. Keeping the existing residential densities is a second basic concept for this Plan. It should be noted that the Master Plan incorporates an ICC Master Plan Alignment Corridor that generally runs from Redland Road to the western boundary of the North Branch Stream Valley Park, east of Cashell Estates and Winters Run.

c. Olney

The Olney Master Plan area encompasses approximately 30,600 acres, or 47.8 square miles, and is located in the northeastern part of Montgomery County (***Figure II-4, Sheet 4***). It is bounded by the Patuxent River to the north and northeast; Hawlings River, parts of James Creek, MD 108, Dr. Bird, Norwood, and Layhill Roads to the east; Norbeck and Muncaster Mill Roads to the south; and North Branch of Rock Creek Stream Valley Park and its eastern spur to MD 108, MD 108 to Laytonsville, MD 108 to Hipsley Mill Road, and Hipsley Mill Road to the west.

The region of Olney has two distinct geographic components. Northern Olney is the area generally north of the Town of Brookeville and Reddy Branch Park. It includes the Agricultural Reserve on the west side, and the rural open space on the east side of Georgia Avenue. Southern Olney includes the Town Center around the intersection of Georgia Avenue and MD 108, and the Southeast Quadrant, which is the area bounded by Old Baltimore Road, MD 108, Dr. Bird Road, Norwood Road, Layhill Road, Norbeck Road, and Georgia Avenue. More than 91 percent of the Master Plan area's housing units are located in southern Olney.

Some of the neighborhoods located within this Master Plan area include Oakdale, Olney Acres, Norbeck Knolls, Anscroft, Sycamore Acres, Norbrook Village, Norwood, Brook Manor Estates, and the Town of Brookeville. The neighborhoods in this area tend to be low to moderate density single-family housing (75 percent of the housing types) surrounded by numerous local and State

management entity for the heritage area and ensure that the activities proposed by the State agency are consistent with the heritage area management plan.

The proposed ICC corridors would pass through two certified heritage areas: the MCHA in Montgomery County and the ATHA in Prince George's County (***Figure II-9***). As described previously, the Lead Agencies initiated consultation with MCHA and ATHA during the DEIS and has continued to consult with these groups and representatives to identify resources and potential impacts as specified in the MOA included as ***Appendix J***. Coordination with MCHA and ATHA is also included in ***Chapter IV.E.3.c***.

E. Natural Environment

1. Topography, Geology, and Soils

a. Topography

Methods

United States Geological Survey (USGS) and Maryland Geological Survey (MGS) topographic maps were reviewed to obtain information on the topography of the study area. Data was also obtained from the *ICC NETR I-270 to US 1* (SHA, 1997). *ESRI ArcView Spatial Analyst* software was used to generate a digital elevation model (DEM) from county planimetric contours. A slope map was then generated using the DEM. The topography was then classified as slopes of 0 to 15 percent, 15 to 25 percent, and 25 percent or greater. The acreage of steep slopes within a 200-foot buffer around each corridor centerline for each option was calculated.

Existing Conditions

The topography within the Montgomery County portion of the study area is generally comprised of gentle slopes with many streams running through narrow valleys. Steeper slopes can be found in the eastern section of the county, where numerous tributaries drain into the Patuxent River. Elevations within the county range from ten feet above mean sea level, at Little Falls on the Potomac River, to 843 feet above mean sea level in the northern part of the county near Damascus, outside the study area. Elevations within the vicinity of the alignments range from around 300 feet above mean sea level within the Northwest Branch Floodplain to 575 feet above mean sea level along MD 97 south of Norwood Road (MGS, 1999).

The topography in the Prince George's County portion of the study area ranges from nearly level to gently rolling. Elevations within the county range from sea level at the Potomac and Patuxent Rivers to 440 feet above mean sea level in the northern part of the county near the I-95/MD 198 interchange. Elevations within the study area are the highest in the county, reaching 440 feet above sea level near the intersection of I-95 and MD 198 (MGS, 1999).

Steep slopes are defined as slopes with an incline of 15 percent or greater and can have unstable soils and vegetation. The western portion of the study area has a greater occurrence of steep slopes than the eastern, which has a more level overall terrain. Within the western portion of the study area, slopes can be greater than 25 percent within the stream valley parks, whereas the eastern portion has more slopes within the 0 to 15 percent range along the I-95 corridor.

The Upper Rock Creek watershed and the Rocky Gorge watershed have the steepest slopes in the study area. In the Upper Rock Creek watershed, the steepest slopes occur in parkland areas along the stream valleys of North Branch and the mainstem of the watershed. In the Rocky Gorge watershed, the steepest slopes occur along the mainstem and the tributaries to the Patuxent River.

The *ICC Natural Environmental Technical Report, I-270 to US 1 (NETR)* (SHA, 2004) is the technical summary of the natural resources within the ICC study area. Detailed methodological and technical information on geological resources is found in this document.

b. Geology

Methods

Geologic units within the study area were identified using information obtained from the USGS *Bedrock Map of Montgomery County, Maryland* (USGS, 1975), the USGS *Geologic Map of the Kensington Quadrangle, Montgomery County, Maryland* (USGS, 1998), and the MGS *Geologic Map of Maryland* (MGS, 1968). Data was also obtained from the *1997 NETR* (SHA, 1997). To identify geologic units near the proposed corridors, geologic maps were compared to study area topographic maps (1" = 200') and preliminary roadway profiles. Major lineations (see ***Chapter II.E.1.b** – Rock Structure - Lineations*) occurring within the study area were identified using geologic mapping and USGS Synthetic Aperture Radar coverage on side-looking, airborne radar (SLAR) black-and-white photographic strip imagery provided in the *1997 NETR* (SHA, 1997). Lineations are shown on ***Figure II-10***.

Existing Conditions

Physiography

The study area is located within two physiographic provinces: the Piedmont and the Atlantic Coastal Plain (***Figure II-10***). The Piedmont Province underlies the western portion of the study area (Montgomery County) and is characterized by igneous and metamorphic rocks of the Paleozoic Era that developed approximately 245 to 570 million years ago (Mader, 1993). The Atlantic Coastal Plain Province underlies the eastern portion of the study area (eastern Montgomery and Prince George's Counties) and is characterized by unconsolidated Quaternary gravel, sand, silt, and clay that was deposited between 65 and 144 million years ago during the Cretaceous age (Mader, 1993). Both provinces are separated by what is known as the Fall Line, which is located in the eastern portion of the study area, approximately between US 29 and I-95 (***Figure II-10***). The Fall Line represents a transition area where Piedmont rocks dip below the unconsolidated sediments of the Coastal Plain.

Stratigraphy

Most of the project study area is underlain by parallel belts of metamorphic rock (crystalline rocks formed in response to great heat, deep burial, and such extreme pressure that the original texture is profoundly altered). For a description of specific rock types and associated geologic mapping, refer to the *ICC NETR, I-270 to US 1* (SHA, 2004). The belts of rock generally align

north-northeast and dip steeply to the northwest or southeast. East of the Fall Line, the study area is underlain by a wedge of sediments increasing in thickness toward the east. These sediments consist of alternating beds of gravel, sand, silt, and clay and form extensive aquifer systems and commercially viable sand and gravel deposits.

Rock Structure/Joints

Late tectonic activity formed a regional joint pattern in the rocks of the Maryland Piedmont. Although the Piedmont rocks in Montgomery County have not been extensively studied, the available information indicates that the regional joint pattern is the youngest structure in the area. This means that the joint pattern is superimposed on folds, faults, intrusions, and shear zones. Information from the USGS indicates that typical joint set orientation is approximately N20°E and N60°W (Cloos, 1964).

Faults and Shear Zones

The document, *Geologic Map of the Kensington Quadrangle*, dated 1998, indicates that two major structures occur in or near the southern portion of the study area: the Brinklow Thrust Fault and the Rock Creek Shear Zone.

According to the aforementioned geologic map, the Brinklow Thrust Fault traverses the eastern portion of the study area from north to south and extends to the north through Liberty Reservoir and Finksburg. The Brinklow Thrust Fault is a boundary between the Loch Raven Schist and the Sykesville Formation where the Sykesville Formation is forced upward by tectonic activity.

The Rock Creek Shear Zone is a long linear tectonic feature that extends from Silver Spring, northeast beyond MD 650; however, information regarding the exact location of its northern terminus is not available. This feature is not completely understood, but it may have originally been a thrust fault that subsequently slipped to both the right and left (Drake, 1998). This thrust fault was reactivated in the Paleozoic Era with dextral strike slip motion and is not active with any regional tectonic activity now.

Lineations

A lineation is a natural linear arrangement of features found in a rock such as fold axes, crenulations, and discontinuities (rock openings). Discontinuities are divided into two types: lineaments and fracture traces. Lineaments extend continuously for more than one mile, while a fracture trace is less than one mile. As such, the corridors are more likely to encounter lineaments than fracture traces. Eleven lineaments were identified within the study area, eight of which cross the proposed alignments (***Figure II-10***). Lineaments and fracture traces can potentially exhibit increased permeability and porosity and serve as groundwater recharge and discharge zones, which could result in the formation of springs and seeps.

Shallow Bedrock

During proposed construction, encounters with bedrock could require either blasting or ripping/excavation with conventional equipment. The particular rock removal method depends on the competence of the rock and depth of required rock cut. Results of the current soil borings

to date indicate that the amount of blasting could be minimal. In general, depth to bedrock increases from west to east along the ICC corridors. Borings at several proposed ICC underpasses with local roads (e.g., Redland Road, MD 115, Emory Lane) reveal rock depth greater than the proposed excavation at these locations. However, blasting is a possibility, but not limited to, the following two locations:

- Rock Creek Option C - on the west side of Rock Creek
- Corridors 1 and 2 - on the east side of North Branch

Fossils

The richest lower Cretaceous period dinosaur fossil site ever found on the East Coast is found outside of any corridors but within the study area in Prince George's County (Kranz, 1992). This area, located south of Contee Road in the Arundel Clay between Beltsville and Muirkirk, is part of a larger area known by paleontologists as "dinosaur alley."

e. Soils

Methods

General Soils Maps were obtained from the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) to identify the soil associations within the study area. The *Montgomery County Soil Survey* (USDA, 1995) and the *Prince George's County Soil Survey* (USDA, 1967) were used to evaluate soils within the study area.

Digital maps of hydric soils and highly erodible soils were used to calculate how much of these soils lie within a 200-foot buffer of each corridor. A geographic information system (GIS) was used to intersect this 200-foot buffer with the soil mapping to tabulate acreages of each soil type within each corridor. No field work was conducted.

Existing Conditions

Soils within the study area range from silt loams in the lowland areas to sandy loams on the upland areas. Within most of the lowland soil types, hydric soils and occasional swamp areas occur. Soils around the more intensely developed cities of Rockville, Bethesda, Gaithersburg, Wheaton, and Silver Spring are disturbed, and are classified as Urban Land by USDA-NRCS. Prime and Unique Farmland soils are addressed in ***Chapter II.E.4.***

General Soil Associations

Seven general soil associations, described below, occur within the study area (***Figure II-11***). Each soil association is identified as having a similar source, but displaying unique characteristics.

Montgomery County

Glenelg-Gaila-Occoquan Association: This is the primary soil association within the study area (>50%), occurring over a large portion of central Montgomery County. These well-drained soils,

which occur on uplands, range from nearly level to strong-sloping. These soils range from deep to very deep and are loamy throughout.

Urban Land-Wheaton-Glenelg Association: This soil association primarily occurs in southern Montgomery County and extends to the county line. These well-drained soils, which occur on uplands, range from nearly level to strongly sloping. These soils are very deep and loamy throughout.

Chillum-Croom-Beltsville Association: This soil association occurs within eastern Montgomery County, extending to the Prince George's County line. These soils, which occur on uplands, are composed of urban land and are well-drained to moderately-drained soils. They range from nearly level to steep and are very deep.

Prince George's County

Manor-Glenelg Association: This soil association occurs in a small area in northern Prince George's County. These deep soils have almost uniform texture throughout. They are well-drained to somewhat-excessively-drained soils which range from nearly level to very steep.

Beltsville-Leonardtown-Chillum Association: This soil association occurs within the northern portion of Prince George's County along the Montgomery County line. These soils are well-drained to poorly-drained, with a compact subsoil or substratum. They are moderately deep and gently sloping soils.

Christiana-Sunnyside-Beltsville Association: This soil association occurs in the northern portion of Prince George's County, extending southwest to the Washington D.C. line and northeast to the floodplain of the Patuxent River. These soils, which have compact subsoil, range from deep, level-to-steep, well-drained, sandy and clayey soils to level-to-sloping, moderately deep, and well-drained soils.

Bibb-Tidal Marsh Association: This soil association is found along the larger stream systems and is made up of mostly alluvial soils of the floodplain. These are poorly drained floodplain soils and soils in marshes that are subject to tidal flooding.

Hydric Soils

According to available mapping, five hydric soil units occur within the ROW of all the study corridors and options. Please refer to the *NETR, I-270 to US 1* (SHA, 2004) for additional information regarding study area hydric soils.

Highly Erodible Soils

Eighteen highly erodible soil units occur within the ROW. Please refer to the *NETR, I-270 to US 1* (SHA, 2004) for additional information regarding study area highly erodible soils.

5. Surface Water Resources

a. Watershed Characteristics and Geomorphic Conditions

Methods

Published information and various agency data sources were reviewed to summarize the watershed characteristics within the study area. Where available, information on the status of the development of TMDLs, or Total Maximum Daily Load, for a particular watershed is noted. A TMDL is a determination pursuant to Section 303(d) of the Clean Water Act of maximum amount of a pollutant that can be introduced into a water body in order for that water body to achieve or remain in compliance with applicable water quality standards. In addition, published information and current data on the geomorphic, or channel-forming, processes of the streams in the study area were collected and analyzed.

Existing geomorphic conditions were also evaluated through field assessments between November 2003 and January 2004 at existing sampling stations throughout the study area. All measurements were performed in accordance with SHA procedures for physical stream assessment (SHA, 2001) and standard methods of geomorphic analyses and stream classification methodologies (Rosgen, 1996). The current data were analyzed to determine the channel geometry, the hydraulic characteristics, the stream classification, and the stream stability. The results of these evaluations were compared to the published data, and time trends and changes in channel characteristics were analyzed. The following section presents an overview of the study area watersheds (***Figure II-13***) and a brief summary of the results of the geomorphic analyses. More detailed information on the methods and findings of the geomorphic assessments are provided in the *NETR, I-270 to US 1* (SHA, 2004).

> Several detailed inventories and planning documents have been reviewed to provide information on the surface water resources within the ICC study area. These include: the M-NCPPC *Environmental Resources Inventory, Upper Rock Creek Watershed* (2000), *Environmental Resources Inventory for Olney and Vicinity* (2002), *Environmental Resources Inventory, Potomac Subregion* (1998), the Montgomery County Department of Environmental Protection (MCDEP) *Countywide Stream Protection Strategy* (1998, 2003); and the *Maryland Clean Water Action Plan* (2002).

Existing Conditions

The study area is located within two major drainage basins: the Potomac River and the Patuxent River. The majority of the study area is located in the Potomac drainage, within the State-designated Metropolitan Washington Basin. Within this basin are a number of smaller watersheds including Potomac River Montgomery County Tributaries, Rock Creek, and the Anacostia River. Only the northeastern corner of the study area is located in the Patuxent drainage. This area includes two State-designated watersheds: Rocky Gorge and Upper Patuxent (DNR, 1997).

While all of the streams in these watersheds are important water resources, only those streams whose watersheds would be directly crossed by the ICC corridors are discussed in this document. These watersheds include Muddy Branch in the Potomac River Montgomery County Tributaries watershed, Upper Rock Creek and North Branch Rock Creek in the Rock Creek watershed, Northwest Branch, Paint Branch, Little Paint Branch, and Indian Creek in the Anacostia basin, and the Rocky Gorge and Upper Patuxent watersheds. The following is a characterization of each watershed (***Figure II-13***). Locations of subwatersheds mentioned in the discussions below are provided on more detailed mapping in the *NETR* (SHA, 2004).

Muddy Branch Watershed

The Muddy Branch watershed is located in the far western portion of the ICC study area, originating in the City of Gaithersburg, just east of MD 355. Because the stream system flows in a southwesterly direction to meet the Potomac River, only the uppermost headwaters, or approximately three square miles of the 19.5 square-mile watershed, fall within the study area (GISHydro2000, 2004). An even smaller portion of the watershed (less than one square mile) falls within the potential ICC corridors. Like many of the tributaries of the Potomac basin in this portion of Montgomery County, Muddy Branch has been influenced by urbanization, particularly along the major historic transportation corridors such as MD 355 and the railroad (MCDEP, 1998). The most highly developed portions of the watershed are in the headwater areas surrounding Gaithersburg. Moving downstream, the Muddy Branch watershed becomes increasingly less developed with forested land eventually becoming the dominant land use as the stream nears the Potomac. The majority of these forested areas are protected in parkland. The density of development in the portion of the watershed in the ICC study area is very high, with approximately 26 percent imperviousness reported by Montgomery County Department of Environmental Protection (MCDEP) in 1998. Based on a City of Gaithersburg study, land use in the Muddy Branch watershed upstream of I-270 is approximately 60 percent urban, 21 percent agriculture, and 17 percent forest (City of Gaithersburg, 2002).

Stream quality is greatly affected by land use patterns in the watershed. The upper portions of the stream suffer the effects of uncontrolled urban runoff from areas developed prior to stormwater management regulations. Incised stream channels, bank instability, and poor biological conditions evidence these effects. Downstream of Gaithersburg and the ICC study area, stream conditions improve to "Fair", and then to "Good" in the lower reaches where undeveloped land uses provide more favorable stream conditions (MCDEP, 2003). Poor biological communities measured by both MBSS and MCDEP have prompted MDE to add Muddy Branch to a list of streams required to have a TMDL developed. Muddy Branch was listed in 2002 as a low priority watershed for TMDL development for biological impairment.

Upper Rock Creek Watershed

The Upper Rock Creek watershed consists of roughly the upper half of the entire Rock Creek drainage area and is located in the central portion of Montgomery County. It includes approximately 95 miles of streams that drain 30.3 square miles of land from the headwater areas north of Fieldcrest Road to Lake Needwood located approximately 1.5 miles upstream of Norbeck Road/MD 28. Lake Needwood is an in-stream impoundment constructed during the

1960s for flood control and recreation (M-NCPPC, 2000). Portions of Upper Rock Creek, including Mill Creek, were listed in 2002 by MDE as a watershed required to develop a TMDL due to poor biological stream conditions measured by MCDEP.

Two major tributaries of Rock Creek, Upper Rock Creek Mainstem and North Branch Rock Creek, cross the ICC study area. Each of these tributaries is a sizeable system with numerous contributing subwatersheds at the point they are crossed by the ICC corridors. Consequently, Upper Rock Creek Mainstem, referred to in this document as Upper Rock Creek, and North Branch Rock Creek are discussed separately to allow for a more detailed assessment of these tributary watersheds.

Upper Rock Creek begins as a small spring emerging from an old springhouse in the Laytonsville area. This high quality coldwater stream is protected by relatively low-density development in its headwaters (M-NCPPC, 2000). While higher levels of imperviousness exist in the tributaries along MD 124, the stream's mainstem remains in good condition all the way to the lake (M-NCPPC, 2003). Relatively unimpaired, Upper Rock Creek supports several of Montgomery County's highest quality stream reaches, some of which have been used to provide reference conditions for evaluating countywide stream conditions.

Imperviousness in this portion of the watershed, upstream of Muncaster Mill Road, ranges from six to eleven percent (MCDEP, 1998). Due to the watershed's relative high quality, its designation as Natural Trout waters by the State and its susceptibility to degradation from development, the County designated the majority of Upper Rock Creek as a Special Protection Area (SPA) in 2004 (***Figure II-13***). This designation provides additional levels of development review and restrictions including an eight percent maximum cap on imperviousness for new development (M-NCPPC, 2000).

Between Muncaster Road and Muncaster Mill Road, Upper Rock Creek increases in size as its drainage area enlarges. Medium density residential development predominates, although there are still areas of large lot developments in the drainage area. The stream valley in this area is in succession from farm fields to young forest (MCDEP, 1998). The Upper Rock Creek watershed contains many subwatersheds supporting excellent stream conditions. Some of these areas are fragmented by stream sections showing signs of impairment and the overall resiliency of this high quality headwater system is somewhat compromised by this pattern. Upper Rock Creek received a rating of "Fair" by the *Countywide Stream Protection Strategy 2003 Update* (MCDEP, 2003). MCDEP is in the process of developing a watershed restoration action plan for addressing stormwater retrofit, stream restoration, and habitat improvements comprehensively throughout the watershed (M-NCPPC, 2000).

North Branch Rock Creek Watershed

North Branch Rock Creek is located in the northwest quadrant of the study area between Muncaster Road and MD 97. The North Branch Rock Creek watershed consists of roughly half of the Upper Rock Creek basin and about one quarter of the entire Rock Creek drainage area in Montgomery County. It includes approximately 48 miles of streams that drain 12.5 square miles of land upstream of Norbeck Road (MD 28), west of Georgia Avenue (MD 97), and south of

MD 108 in central Montgomery County. North Branch Rock Creek flows into Lake Frank before joining the mainstem near Avery Road. Lake Frank is an in-stream impoundment constructed during the 1960s for flood control. North Branch Rock Creek has not been directly targeted for a TMDL but is included in the low priority TMDL requirement for the Rock Creek watershed due to biological impairment.

The upper reaches of the North Branch Rock Creek are the most rural of the streams in the watershed. Farms, forested areas, and large-lot developments dominate the area. Imperviousness in this portion of the watershed ranges from four to six percent (MCDEP, 1998). Between Bowie Mill Road and Muncaster Mill Road, low to medium density residential development predominates with scattered areas of large-lot development. The imperviousness of the basins which drain directly to the mainstem range from three to seven percent, but the larger tributaries to this segment of the drainage basin have considerably higher percentages of imperviousness. The floodplain areas are largely undeveloped parklands (M-NCPPC, 2002).

According to the Countywide Stream Protection Strategy (CSPS), the stream condition in the watershed ranges from "Excellent" to "Poor." The CSPS divides the North Branch Rock Creek watershed into 13 subwatersheds. Except for Lower North Branch, all subwatersheds are designated as either restoration or protection areas. The CSPS also identifies six priority subwatersheds, representing about one half the entire North Branch Rock Creek watershed area. The portion of the North Branch Rock Creek watershed west of the mainstem of the stream is designated as part of the Upper Rock Creek SPA by Montgomery County.

Northwest Branch Watershed

Northwest Branch is located in the central portion of the study area between Georgia Avenue (MD 97) and New Hampshire Avenue (MD 650). Northwest Branch is the largest of Montgomery County's contributing watersheds to the Anacostia River. The Anacostia River basin is in Category 1 of the *Maryland Unified Watershed Assessment* (UWA) under the 1998 *Clean Water Action Plan* (MCDEP, 2002), having been found not to meet clean water and other natural resource goals. The Anacostia River is also designated a priority watershed most in need of restoration, although it is also listed as a Category 3 (preservation) watershed considered to have at least some streams of high quality condition. Thus, the watershed shows signs of stress and degradation in some sections, but still contains sensitive habitat resources (M-NCPPC, 2002). In 2002, the Anacostia River was designated by MDE as a low priority watershed in need of a TMDL due to biological impairment. Data from sampling conducted by MCDEP and DNR's Maryland Biological Stream Survey (MBSS) within Northwest Branch were included in the decision to require this TMDL.

The largest land uses, by area, in the Northwest Branch watershed include 52 percent residential, 22 percent forest cover, 9 percent agricultural, and 7 percent parkland. The Northwest Branch watershed is 41.9 square miles and approximately 17 percent impervious in the study area (EPA EMPACT, 2001).

The headwaters of the Northwest Branch watershed are largely semi-rural with some agricultural and low density residential land uses dominating along with several large tracts of undeveloped

land. The lower portions of the watershed are more urbanized with higher residential densities and some commercial development. Forty-five percent of the stream miles have an adequate riparian forest buffer.

The MCDEP's CSPS, 2003 Update indicates that the Northwest Branch has a "Fair" rating. The upper reaches of the Northwest Branch are comprised of predominantly low-density land uses and the landscape is in a transition from formerly widespread agricultural land uses to a more suburban landscape. The middle section of the watershed contains a mix of moderate to higher density land uses along with large areas of forested parkland. Inadequate stream buffers on the tributaries and flashy urban hydrology are common in this section. The lower reaches of Northwest Branch contain older and more concentrated development where communities developed long before requirements for stream valley protection or stormwater management. In the lower reaches, hydrology has been considerably altered by urbanization and the stream condition is generally "Fair" or "Poor". However, it is in the lower reaches that this part of the watershed is described as "the most scenic and rugged section of the Anacostia watershed."

Near the southern boundary of the ICC study area, this transitional area, where the Northwest Branch leaves the Piedmont eco-region and passes through the Fall Line before entering the lower gradient reaches of the coastal plain eco-region, contributed to the State identifying the Anacostia as a State "Scenic and Wild River" in 1984 under the Maryland Scenic and Wild Rivers Act.

Paint Branch Watershed

Paint Branch is located in the southeast quadrant of the study area between New Hampshire Avenue (MD 650) and Old Columbia Pike on the south side of Spencerville Road (MD 198). Seventy-two percent of the watershed is in Montgomery County with the remaining 28 percent in Prince George's County. The Paint Branch watershed is 20.8 square miles in size and approximately 18 percent impervious in Montgomery County. Dominant land uses include 42 percent residential, 26 percent forest cover, 12 percent agricultural, 10 percent institutional, and 5 percent parkland. The Paint Branch is one of the least intensely developed watersheds in the Anacostia basin. Fifty-three percent of the stream miles of Paint Branch have an adequate riparian forest buffer, confined to the upper two-thirds of the watershed (EPA EMPACT, 2001). The MCDEP's CSPS, 2003 Update, indicates that the Paint Branch has a "Good" rating for watersheds. The Paint Branch supports a unique county and regional resource – an urban cold-water fishery and wild (naturally reproducing) brown trout population, surrounded by suburban development and located in close proximity to the nation's capital. The upper reaches (particularly Good Hope and Gum Springs) provide essential spawning/nursery habitat and cold clean water for young trout. Zoning, land use, and Montgomery County SPA requirements in place for the upper watershed, plus continuing stream buffer acquisition and stream restoration efforts, are intended to mitigate development impacts on the stream resource. Monitoring results for this update show that most of the upper portions of the watershed support good stream conditions.

Large areas of forested parkland serve to protect the riparian area through much of Upper Paint Branch as well as to keep overall watershed imperviousness relatively low upstream of Fairland

Road. Due to the unique wild trout fishery and high quality cold-water ecosystem, SPA designation was legislatively granted by Montgomery County for the Upper Paint Branch in 1995. This was done to protect the resource from new developmental impacts. Land developed after the implementation of this legislation is limited to a ten percent maximum impervious area. Montgomery County has acquired extensive areas of land and recommended others for further acquisition as open space in order to control the increase of impervious area.

Most of the subwatersheds downstream of the SPA are listed as Watershed Restoration Areas by the Montgomery CSPS due to impacts from previous development affecting all the tributaries to some extent. The Middle Mainstem is protected by parkland; however, sediment deposition from tributaries and upstream areas affect habitat conditions and it is therefore listed as a Remedial Level Watershed Protection Area. In 2002, the Anacostia River was designated by MDE as a low priority watershed in need of a TMDL due to biological impairment. Data from sampling conducted by MDCEP within Paint Branch were included in the decision to require this TMDL.

Little Paint Branch Watershed

Little Paint Branch is located in the southeast quadrant of the study area between Old Columbia Pike and Old Gunpowder Road south of Spencerville Road (MD 198). The Little Paint Branch is a free-flowing tributary of the Paint Branch, which subsequently joins Indian Creek in forming the Northeast Branch of the Anacostia. According to the Little Paint Branch Watershed Study (MCDEP, 1997), 52 percent of the watershed is in Montgomery County, and 48 percent is in Prince George's County. The Little Paint Branch watershed is 10.5 square miles in size and approximately 19 percent impervious in Montgomery County. Dominant land uses include 37 percent residential, 31 percent forest cover, and 11 percent agricultural (primarily the USDA Beltsville Agricultural Research Center – [BARC]) (EPA EMPACT, 2001). Development covers approximately half of the Little Paint Branch watershed. The least developed areas of the watershed occur along the upper reaches of the watershed above Greencastle Road and along the Montgomery/Prince George's County border in the Little Paint Branch Stream Valley Park. Forty-eight percent of the stream miles retain an adequate forest buffer (M-NCPPC, 1997). The forest tracts are located predominantly in the upper half of the watershed. The largest contiguous forested area lies within Fairland Regional Park.

The MCDEP's CSPS, 2003 Update, indicates that the Little Paint Branch is rated as "Fair". The upper portions of the Little Paint Branch remain in good condition and still provide habitat necessary to support healthy communities of fish and aquatic insects. Conditions decline rapidly downstream as many portions of the watershed were developed before requirements for stormwater control. The watershed contains high quality stream reaches in its northern Montgomery County tributaries that are a high priority for protection to maintain a functioning stream system. In 2002, the Anacostia River was designated by MDE as a low priority watershed in need of a TMDL due to biological impairment. Data from sampling conducted by MDCEP and MBSS within Little Paint Branch were included in the decision to require this TMDL.

Indian Creek Watershed

Indian Creek is located in the southeast quadrant of the study area between Old Gunpowder Road and the eastern terminus of the project, south of Spencerville Road (MD 198). The Indian Creek watershed is located completely within Prince George's County.

Land uses in the Indian Creek watershed include 29 percent forest cover, 26 percent residential, 12 percent extractive sand and gravel mining, 11 percent agricultural, and 9 percent industrial. The Indian Creek watershed is 15.5 square miles in size and approximately 20 percent impervious (EPA EMPACT, 2001). The upper portion of the Indian Creek watershed, located upstream of Virginia Manor-Ammendale Road, is dominated by abandoned and active sand and gravel mining operations and forest cover; much of the forest cover is classified as scrub/shrub (regenerating). These extensive abandoned sand and gravel mines contribute large amounts of sediment to the watershed. In its lower reaches, Indian Creek passes through a highly urbanized commercial and residential corridor (EPA, 1989). Based on physical and biological stream data gathered by Prince George's County Department of Environmental Resources (PGDER) and a watershed study by the Lead Agencies, conditions in Indian Creek are "Poor", largely due to the highly disturbed nature of the watershed and the water quality impacts of mining and urbanization. Data from sampling within Indian Creek were included in the 2002 decision to designate the Anacostia River as a low priority watershed in need of a TMDL due to biological impairment.

Rocky Gorge Watershed

The Rocky Gorge watershed is part of the Patuxent River system and is located in the northeast quadrant of the study area between the eastern terminus of the project and MD 650 north of MD 198. All of the streams within the Rocky Gorge watershed drain to the T. Howard Duckett (Rocky Gorge) Reservoir, an impoundment of the mainstem of the Patuxent River. Approximately 39.2 percent of the watershed is located within the project study area. The reservoir provides drinking water for portions of Montgomery, Howard and Prince George's Counties. According to the DNR, the Rocky Gorge watershed consists of 8,797 acres of urban land use, 12,056 acres of agricultural land use, 12,320 acres of forested land, and 195 acres of barren land. There is approximately 9.4 percent imperviousness.

The Maryland Clean Water Action Plan (1998) identifies the Rocky Gorge watershed as needing restoration and deserving priority consideration. The Rocky Gorge watershed is also designated as a priority watershed most in need of restoration. In addition, the watershed is listed as a Selected Category 3 (Preservation) watershed that has at least some streams with high quality conditions (M-NCPPC, 2002). DNR and WSSC are coordinating to develop a *Comprehensive Forest Conservation Plan* on over 6,000 acres of WSSC land for Rocky Gorge and Triadelphia Reservoirs. The plan will be developed using an ecosystem approach, evaluating many different components of forests (DNR Forests website). The MCDEP CSPS 2003 Update of the county's urban watersheds notes that even though much of the land is protected by parkland, buffers and master planning, only the upper portion of the watershed supports good stream conditions; the lower half has fair stream conditions.

The Rocky Gorge Reservoir and its tributaries have been listed by MDE as a watershed required to have a TMDL developed. Fair and Poor biological conditions measured by MCDEP and MBSS in tributaries leading to the reservoir have supported the decision in 2002 to have a low priority TMDL developed for biological impairment. In 1998, the Rocky Gorge Reservoir was listed as a medium priority requirement for a nutrient based TMDL.

Upper Patuxent River Watershed

A portion of the Upper Patuxent River watershed is located in the far northeastern corner of the study area, in the vicinity of the I-95/MD 198 interchange. The watershed as a whole is over 88 square miles in size and extends in a southeasterly direction from the Rocky Gorge Dam to an area downstream of MD 214 in Anne Arundel County. Less than eight percent of the watershed falls within the ICC study area. Two primary tributaries, Bear Branch and Walker Branch, drain this portion of the watershed, and are crossed by potential improvements to I-95 associated with both of the ICC corridors.

The Upper Patuxent River watershed is approximately 46 percent forest, 31 percent urban, 22 percent agriculture, and 1 percent wetlands and barren land (DNR, Surf Your Watershed online). However, the portion of the watershed drained by Bear Branch and Walker Branch is substantially more developed than the larger watershed, with approximately 58 percent in urban land use and only an estimated 23 percent in forest (GISHydro2000, 2004). Impervious cover is approximately 35 percent in the two subwatersheds combined. Both subwatersheds flow through dense areas of development associated with the City of Laurel, and Bear Branch has been impounded upstream of US 1 to form Laurel Lakes. A few areas of protected parkland exist along the stream system, but the majority of the riparian areas appear to be privately owned. The upstream portions of the Bear Branch subwatershed were historically mined for sand and gravel, but are now being converted to commercial and residential land uses.

The Upper Patuxent River watershed is listed as impaired by the State for nutrients and suspended sediments and was designated in the 1998 *Maryland Clean Water Action Plan* as a priority watershed in need of restoration (DNR, 2002). In 2002, the Upper Patuxent River was designated by MDE as a low priority watershed in need of a TMDL due to biological impairment. A medium priority TMDL was required due to bacteria contamination. Based on a recent assessment, water quality is generally in the good to "fair" range in the Patuxent mainstem below the Rocky Gorge Dam, with quality decreasing downstream as more nutrients and sediments are added to the stream from non-point sources. The Patuxent mainstem supports a warm-water recreational fishery. In April, DNR stocks the mainstem with trout below the dam. Walker Branch and Bear Branch generally have poor stream conditions due to uncontrolled runoff from development, past gravel mining, and limited riparian buffers (DNR, 2002).

b. Chemical Water Quality

Methods

For the purposes of this document, discussions of water chemistry include both in-situ multi-probe sampling and chemical sampling. In-situ data are defined as data collected with field measurement techniques such as water quality meters, as opposed to detailed laboratory analysis.

Chemical sampling is defined as sampling where water samples were collected in the field and transported to a certified laboratory for detailed analysis.

Existing water chemistry data were gathered from the MCDEP, M-NCPPC, PGDER, DNR and SHA 1997 ICC *NETR, I-270 to US 1*. Using GIS, the sampling locations provided by MCDEP, M-NCPPC, DNR, and PGDER were overlaid on a base map of the study area to determine areas that lacked coverage by the existing data. Nineteen new sampling locations were chosen throughout the watershed (***Figure II-14***) to update the existing information and to provide data for areas that had not been previously sampled.

In-situ and chemical sampling were conducted during the summer and fall of 2003 at each of the 19 sites. In-situ sampling included collection of data on pH, temperature, dissolved oxygen, conductivity, and turbidity with a multi-probe water quality meter, and was conducted in both wet and dry weather conditions. Chemical water quality samples were taken and lab analyzed to provide data on metals, nutrients, and other parameters not assessed during in-situ sampling. These lab-analyzed samples were collected during dry weather conditions and samples were preserved in accordance with U.S. Environmental Protection Agency (EPA) guidance (EPA, 1999). A laboratory approved by the State of Maryland conducted the analysis of the water samples. Temperature sampling was conducted by the Lead Agencies during the summer of 2004 to supplement existing data gathered for this study. More detail on the results of the Lead Agencies' temperature monitoring is provided in ***Appendix D***. Additional details regarding the parameters sampled and State and Federal standards are located in the *NETR* (SHA, 2004).

In 2005, the Lead Agencies developed a nonpoint source pollutant load model for the study area watersheds to estimate pre- and post ICC pollutant loads from the proposed project right-of-way in comparison to future pollutant loads after an ICC is built. Pollutant loads for fecal coliform, total suspended solids (TSS), total kjeldahl nitrogen (TKN), total phosphorous (TP), nitrate-nitrite, total copper, and total zinc were modeled based on existing land use in the proposed right-of-way. Post-construction ICC pollutant loads from the right-of-way were also modeled, and incorporated stormwater best management practices (BMPs) were applied. The results from the modeling of pre- and post-development loads from the ICC right-of-way is included in the Environmental Consequences, ***Section IV.F.5.b, Water Quality***.

Existing Conditions

The study area streams included in each State of Maryland Use Class designation are as follows:

- Use I (water contact recreation and the protection of aquatic life) for Muddy Branch, Little Paint Branch, Indian Creek, and the Upper Patuxent River
- Use I-P (water contact recreation, protection of aquatic life, and public water supply) for Rocky Gorge tributaries
- Use III (natural trout waters) for Paint Branch, Rock Creek north of MD 115, and North Branch Rock Creek north of MD 115
- Use IV (recreational trout waters) for Rock Creek south of MD 115, North Branch Rock Creek south of MD 115, and Northwest Branch

Detailed water quality analysis including chemical analyses, temperature, pH, dissolved oxygen levels, turbidity, and fecal coliform concentrations for the watersheds can be found in the *NETR* (SHA, 2004).

Muddy Branch Watershed

Water quality in Muddy Branch is generally within State standards, though extensive sampling has not been conducted in the area of the watershed that would be affected by the ICC. Only two sampling stations were available for the watershed and no long-term temperature monitoring was available. No in-situ water quality data were collected in this watershed during 2003. Limited water temperature monitoring data were available for the portion of Muddy Branch impacted by the project. Though it is not clear that these data are representative of current conditions, they do show temperatures well below the 90°F maximum standard for Use I streams.

Upper Rock Creek Watershed

Overall, water quality parameters in Rock Creek indicate varying conditions throughout the watershed. Crabbs Branch and Mill Creek, the most urbanized of the subwatersheds, showed the greatest amount of impacts to water quality. Rock Creek Mainstem, located north (upstream) of MD 115, showed elevated temperatures sufficient to cause stress in trout populations. Chemical sampling shows elevated levels of nutrients, an indication of human-induced effects. Though not elevated enough to cause an acute impact on aquatic life, water quality problems could affect overall composition and diversity of aquatic communities. Tributaries to the mainstem of Rock Creek such as Mill Creek and Crabbs Branch appear to contribute to the elevated nutrient and contaminant levels. Fecal coliform levels indicate an influence of sewage in the watershed. Seasonal monitoring showed water temperature levels generally above the State standards for Use III and IV waters in 1995. A lack of regular annual monitoring with automatic continuous temperature loggers makes it difficult to determine whether or not these elevated temperatures are typical for the Rock Creek watershed. However, monitoring that occurred in 2004, a year with summer air temperatures slightly below normal, showed water temperatures that exceeded the 75 degree limit for Use IV waters less than 10 percent of the season. More detail on 2004 temperature studies is provided in ***Appendix D***.

North Branch Rock Creek Watershed

Overall, the North Branch of Rock Creek shows limited anthropogenic water quality impacts. Existing and current data shows that most in-situ measurements are within State standards, but chemical sampling shows there is a slight increase in nutrient levels. Elevated levels of total solids and chlorides are indications of increasing urbanization and stress on the water quality of the North Branch. Very limited seasonal temperature monitoring data were available for the North Branch. Though it is not clear whether these data provide an accurate picture of the typical temperatures within the stream, they do suggest that the temperatures within North Branch are at levels sufficient to induce stress on a trout population. For example, the most recent sampling, conducted by the Lead Agencies in 2004, found that over fifty percent of the summer readings at three mainstem stations near the study corridor exceeded the 68 degree limit for Use III waters.

Northwest Branch Watershed

Overall, a large network of water chemistry sampling locations has shown that the mainstem of Northwest Branch is impacted to a greater extent than its tributaries. Elevated temperatures, low dissolved oxygen levels, and acidic waters create a degraded stream condition not favorable for recreational trout waters and pollution sensitive aquatic organisms. Elevated levels of nutrients and other constituents can be found in the watershed, but not at levels acutely detrimental to the health of aquatic organisms, though enough to cause shifts in the composition of biological communities. Seasonal monitoring by MCDEP showed that water temperatures within Northwest Branch exceed the limit for recreational trout waters during a substantial portion of the summer, especially in the mainstem and the Right Fork. However, monitoring by the Lead Agencies in 2004, a year with summer air temperatures slightly below average, showed only two percent of readings exceeding the 75 degree standard in the mainstem and less than one percent of the readings exceeding the standard in Batchellors Forest Tributary. Despite possible water temperature limitations in some years, Northwest Branch has been and is currently managed as a successful recreational trout fishing stream. This success is mainly due to stocking of adult trout that is focused in the spring and fall when water temperatures are generally cooler.

Paint Branch Watershed

Overall, Paint Branch shows the highest levels of metals of all the study area watersheds. Though well below State criteria, metals concentrations were shown to be higher and more consistent in Paint Branch than in any other study area watershed. Additionally, consistently low pH values and temperatures elevated above Use III criteria indicate increased stress on the local trout and other aquatic populations. These lower pH values may contribute to the availability and concentrations of metals. Minor fecal coliform contamination and elevated levels of phosphorous are found within the mainstem of Paint Branch. A relatively large network of seasonal temperature monitoring stations has been established within Paint Branch by MCDEP, though these stations have not always been consistently monitored year after year. Each subwatershed showed very different water temperatures without obvious cooling or warming trends. All of the monitoring stations recorded temperatures above the maximum allowable 68°F at least once during the summer. The Right Fork and Mainstem showed consistently higher overall temperatures than other Paint Branch subwatersheds. The Good Hope, Left Fork, and Gum Springs all showed substantial temperature variability between each monitoring station, making it difficult to show definitive trends within the subwatershed. In 2004, the Lead Agencies conducted a targeted temperature monitoring study in the Good Hope subwatershed to evaluate the relative temperature effects of inputs from tributaries to the Good Hope. The study found that while some of the tributaries experience notable temperature impacts in their headwaters, considerable cooling from baseflow occurred before they reached the Good Hope. None of the tributaries exceeded the 68 degree standard in more than 20 percent of the readings at the confluence with the Good Hope. Furthermore, the Good Hope mainstem was able to assimilate the slightly elevated temperature inputs from the tributaries, as readings from the Good Hope ranged from 6 percent to 9 percent of readings being above the temperature standard. It is not clear whether these findings can be extrapolated beyond 2004, however, as above average precipitation and slightly cooler than average air temperatures were present throughout the period of study. More information on this temperature study can be found in ***Appendix D***.

Little Paint Branch Watershed

In general, Little Paint Branch shows moderate impacts to chemical water quality. Extensive historic and current gravel mining in the headwaters of the watershed most likely contributes to the degraded water quality. Elevated levels of chlorides, metals, nutrients, and fecal coliforms indicate anthropogenic impacts within the watershed. Very limited existing temperature monitoring data were available for Little Paint Branch. However, based on available data and more recent temperature monitoring by the Lead Agencies in 2004, temperatures appear to remain well below the allowable limit of 90 °F.

Indian Creek Watershed

Overall, Indian Creek suffers from a moderate amount of water quality impacts. Most measurements of in-situ parameters such as dissolved oxygen, pH, temperature, conductivity, and turbidity generally appear to be acceptable. Elevated levels of nutrients and other constituents may be having an impact on the quality and diversity of the aquatic community of the watershed. No existing seasonal temperature monitoring data were available for Indian Creek but in-situ measurements and sampling by the Lead Agencies in 2004 show temperatures below the allowable limit of 90 °F.

Rocky Gorge Watershed

Overall, historical and new data show low to moderate impacts to water quality. Slightly acidic conditions and nutrient enrichment are present but do not greatly impact the aquatic community, though the reservoir has historically been listed as impaired for nutrients. No seasonal temperature monitoring data were available for Rocky Gorge but in-situ measurements show temperatures well below the allowable limit of 90 °F.

Upper Patuxent River Watershed

Overall, the Upper Patuxent River watershed shows moderate impacts to chemical water quality. In-situ parameters sampled were well within State standards in all subwatersheds sampled. During the spring of 2003, chemical grab samples were laboratory analyzed for the I-95/Contee Road *NETR, I-270 to US 1*. This sampling showed minor impacts within Bear Branch and greater impacts within Walker Branch. Total solids levels were approximately ten times higher than the EPA standard for aquatic life in both Bear and Walker Branches. Within Walker Branch, high fecal coliform levels indicate sewage pollution in the watershed. Slightly elevated nutrient levels were also found within Walker Branch. Although no long-term seasonal water temperature monitoring was conducted within the watershed, in-situ samples show temperatures well below the regulatory limit.

c. Reservoirs

Most of the streams in the study area in the Upper Patuxent River watershed drain to the Rocky Gorge Reservoir, also known as the T. Howard Duckett Reservoir. This reservoir, along with Triadelphia Reservoir, not far upstream on the Patuxent River, provides a vital drinking water source to between 550,000 to 650,000 people. In addition, the reservoir acts as regional backup

d. Scenic and Wild Rivers

Methods

The coordinator of the DNR Scenic and Wild River Program was contacted to determine which study area streams are designated as scenic and wild by the State.

Existing Conditions

There are no Federally designated Wild and Scenic Rivers in Maryland. The Anacostia and Patuxent Rivers and the Potomac River in Montgomery County and their tributaries are designated as Scenic under the Maryland Scenic and Wild Rivers Program. A Scenic River is a "free-flowing river whose shoreline and related land are predominantly forested, agricultural, grassland, marshland, or swampland with a minimum of development for at least two miles of the river length" as defined by Code of Maryland Regulations (COMAR). The study area tributaries to the Potomac River, Anacostia River and Patuxent River that fall under this designation are Muddy Branch, Indian Creek, Little Paint Branch, Paint Branch, Northwest Branch, Tributaries to the Patuxent River including those in the Rocky Gorge watershed, and Bear Branch, a tributary to the Upper Patuxent River watershed.

6. Aquatic Biota

a. Methods

Existing data on aquatic biota within the study area were gathered from MCDEP, M-NCPPC, PGDER, and DNR. These agencies have ranked the quality of the habitat and biological communities in many of the study area streams based on detailed field sampling and comparison with "least-impaired" reference conditions. MCDEP and M-NCPPC work cooperatively, using the same methods, to survey streams in Montgomery County. Because MCDEP maintains the joint data set for the two agencies, data on aquatic biota collected by both agencies are referred to as MCDEP data for the remainder of this document, though it is important to note that M-NCPPC data are included in this data set. In many cases, methods for collection and analysis of existing data on aquatic habitat, macroinvertebrates, and fish vary between agencies. Specific methods of collection and analysis and differences in methods that affect interpretation and comparison of results are described in detail in the *NETR, I-270 to US 1* (SHA, 2004). The Benthic Index of Biotic Integrity (BIBI) rankings used by each agency are defined in ***Table II-13***.

For the purposes of this study, only data collected since 1995 were considered current enough to represent existing conditions in the study area. Current data from 109 MCDEP stations, nine PGDER stations and 33 DNR stations were available for the study area's watersheds. The locations of each of the stations are shown in ***Figure II-14***. Data from these stations are summarized below and provided in detail for each station in the *NETR, I-270 to US 1* (SHA, 2004).

It was the goal of the study to have data coverage upstream, downstream, and/or within the potential study corridors within all major watersheds. It was also decided that existing data collected from 1995-1999 should be updated with new sampling. As existing data were collected

and reviewed, data collection points were plotted on project mapping to assess spatial and temporal coverage of existing information. Streams where adequate data on habitat, macroinvertebrates, and fish did not exist were determined to be data gaps that needed to be filled with new field monitoring in 2003-2004. Fifteen stations were determined to require collection of additional aquatic biota data. These fifteen stations are included in the nineteen stations chosen for the collection of chemical water quality data.

Table II-13
DNR/PGDER and MCDEP BIBI Scores and Rankings

DNR[1]/PGDER		
BIBI Score	**Narrative Ranking**	**Characteristics**
4.0 – 5.0	Good	Comparable to reference streams considered to be minimally impacted, biological metrics fall within the upper 50 percent of reference site conditions.
3.0 – 3.9	Fair	Comparable to reference conditions, but some aspects of biological integrity may not resemble the qualities of minimally impacted streams.
2.0 – 2.9	Poor	Significant deviation from reference conditions, indicating some degradation. On average, biological metrics fall below the 10th percentile of reference site values.
1.0 - 1.9	Very Poor	Strong deviation from reference conditions, with most aspects of biological integrity not resembling the qualities of minimally impacted streams, indicating severe degradation. On average, most or all metrics fall below the 10th percentile of reference site values.
MCDEP		
≥ 35	Excellent	Index of Biotic Integrity (IBI) scores within the upper 50 percent of reference site conditions are assigned to this highest attainable IBI class.
26 – 34	Good	Decreased number of sensitive species, decreased number of specialized feeding groups with some intolerant species present.
17 – 25	Fair	Intolerant and sensitive species are largely absent; unbalanced feeding group structure
≤ 17	Poor	Top carnivores and many expected species are absent or rare; general feeders and tolerant species dominate.

[1]The DNR Maryland Biological Stream Survey (MBSS) methods were also used by the Lead Agencies for all new benthic surveys for the ICC
Source: Roth et a., 1997; MCDEP, 1998

b. Existing Conditions

The streams in the study area provide habitat for a wide variety of aquatic biota. Although many of the streams and their watersheds (see ***Figure II-13***) have been impacted by past and present human activities in the watershed, the streams support a thriving biological community. A total of 47 different fish species have been documented in the study area's watersheds. One of these fish, the comely shiner, is listed as a threatened species by the state of Maryland. More information on this species and coordination with DNR is included in ***Section II.E.10, Rare Threatened and Endangered Species***. A number of the larger streams are seasonally stocked with game fish to provide additional opportunities for anglers to utilize the resource. Some streams also provide vital freshwater spawning habitat for anadromous fish species. In addition, hundreds of species of macroinvertebrates inhabit the waterways, providing an important food source for larger organisms as well as an important indicator of overall stream conditions. The quality of aquatic habitat, and macroinvertebrate and fish communities documented in each of

the study area's watersheds is discussed below. More detailed information on aquatic biota is contained in the *NETR, I-270 to US 1* (SHA, 2004).

Muddy Branch Watershed

Habitat scores within the upper portion of the Muddy Branch watershed were in the "Good"/"Fair" range for the MCDEP physical habitat index. Incised stream channels, unstable banks, sediment deposition, and embeddedness contribute to a somewhat impaired habitat condition in this watershed. The habitat impairment in the headwater streams is primarily caused by high levels of impervious cover (26 percent) and inadequate riparian buffers (MCDEP, 1999).

The macroinvertebrate community in the upper watershed was rated as "Poor", which may be the result of water quality impairment not detected with the basic in-situ sampling conducted by the county. In addition, the lack of riparian buffers and flashy flows in this highly developed portion of the watershed could limit the food sources required to support more diverse benthic communities.

Thirty-two different species of fish were documented in the Muddy Branch watershed by MCDEP. It should be noted, however, that the majority of the species known to exist in Muddy Branch would not be expected to be found directly in the ICC study area. The majority of these species were most likely documented in the downstream areas of Muddy Branch where improved quality and larger stream size would allow for a wider range of species. The portion of the watershed within the study area includes only small headwater streams that would be expected to contain species tolerant of lower quality habitat and development impacts.

Upper Rock Creek Watershed

The condition of the aquatic habitat and biota of Rock Creek overall reflects the characteristics of the watershed. The watershed supports relatively high-quality fish and macroinvertebrate communities, particularly in areas where habitat degradation from watershed disturbances is minimal. The majority of Upper Rock Creek was designated as an SPA (***Figure II-14***) by Montgomery County in 2004 for its Use III-Natural Trout Waters status and its high quality aquatic conditions. The streams with the highest benthic macroinvertebrate and fish community scores had high habitat scores. In fact, in all cases, when benthic and/or fish were rated as "Good" or "Excellent", habitat was also rated as "Good" or "Excellent", verifying the importance of physical stream conditions to the support of healthy biological communities. The streams with the best overall conditions in order of quality were the Left Fork, Pope Farm Tributary, Right Fork and Mainstem above Muncaster Mill Road (MD 115). These are also generally the streams with the lowest levels of watershed imperviousness. With the exception of Pope Farm, which had 11 percent, all of these subwatersheds were reported in 1998 to have impervious percentages between six percent and eight percent. The most impaired overall conditions were found in Crabbs Branch, Mill Creek and Southlawn Branch where the greatest levels of impervious area and chemical water quality impacts exist. Aquatic community scores in these subwatersheds were in the "Poor" to "Fair" range, though areas where stormwater management had been retrofitted had slightly less impaired habitat conditions.

Thirty-one different fish species were documented in Upper Rock Creek (including North Branch Rock Creek) by MCDEP, DNR, and SHA. Although generally not uncommon, two of the species found in Upper Rock Creek, Potomac sculpin (*Cottus girardi*) and white catfish (*Ameiurus catus*), were not documented in other study area watersheds. Game fish collected in the watershed include smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), and rainbow trout (*Oncorhynchus mykiss*). DNR stocks Lake Needwood with trout in the Spring; the 2004 stocking included the release of 3,000 trout in March and April. No anadromous or catadromous fish were documented in this portion of Rock Creek due to impassable migratory fish blockages that exist at Lake Needwood and in other downstream portions of the watershed. Past species stocked in Lake Needwood include largemouth bass, tiger muskellunge (*Esox masquinongy*), channel catfish (*Ictalurus punctatus*), and several species of panfish (M-NCPPC, 2000).

North Branch Rock Creek Watershed

North Branch Rock Creek, above MD 155, is classified as Use III-Natural Trout Waters by the State of Maryland, though conditions do not currently support a viable trout population. In addition, it was designated as an SPA by Montgomery County in 2004 to protect the environmental quality of the watershed. The overall aquatic resource conditions in North Branch Rock Creek are "Good", but vary somewhat with "Good" to "Excellent" conditions in the upper areas of the watershed, "Good" to "Fair" conditions in the portion of the Mainstem between Bowie Mill Road and the confluence with the Cherrywood Manor tributary, and "Good" to "Excellent" conditions once again immediately above and below MD 115. Similar to Rock Creek, the North Branch's best biological communities were only found in areas with highly rated habitat. The best conditions are found above Bowie Mill Road where 1998 impervious percentages were below six percent; surrounding Muncaster Mill Road where low overall imperviousness and bedrock outcrops and seeps maintain habitat conditions; and surprisingly in Cherrywood Manor tributary where impervious area was reported as 14 percent in 1998 and 16.6 percent in 2000 (MCDEP, 1998 and M-NCPPC, 2003). As noted above, 31 different species of fish have been documented in the Rock Creek and North Branch Rock Creek watersheds. The State-threatened comely shiner was found in the North Branch Rock Creek mainstem south of Muncaster Mill Road in 1995, but has not been recorded by MCDEP in the watershed since that time. The most consistently impaired aquatic conditions were documented in Manor Run with both macroinvertebrate and fish communities being scored as "Poor" due to limiting habitat conditions from high watershed imperviousness.

Northwest Branch Watershed

Northwest Branch is a larger watershed than both Upper Rock Creek and North Branch Rock Creek and appears to suffer greater negative effects to aquatic habitat and biota. Although the Upper Mainstem and its tributaries are relatively undeveloped and have impervious totals below 10 percent, the Mainstem and tributaries below Norwood Road have impervious totals from 12 to 23 percent, above levels widely believed to cause measurable aquatic impairment. In general, aquatic biota is "Good" to "Fair" in the Upper Mainstem with benthic communities becoming more impaired in the Middle Mainstem and other downstream areas. The best overall conditions for aquatic biota are found in Bryant's Nursery Tributary (seven percent impervious) where

habitat, macroinvertebrates, and fish have consistently been rated as "Good" or "Excellent" since 1996. The most-impaired benthic and fish communities are located in Bel Pre Tributary, Longmead Tributary and Norwood Tributary. Bel Pre and Longmead Tributaries are relatively heavily developed and have habitat impairment that negatively affects the macroinvertebrate communities (MCDEP, 1998).

Thirty species of fish have recently been documented within the portion of Northwest Branch in the study area. One species, the comely shiner, found in 2003 in Northwest Branch near Corridor 1 during the sampling study, is listed as threatened by the State of Maryland. More information regarding coordination with DNR regarding this species is presented in ***Section II.E.10, Rare, Threatened and Endangered Species***. Although not uncommon in the State, one species found in Northwest Branch, the fantail darter (*Etheostoma flabellare*), was found in only one other study area watershed, Muddy Branch. Sampling conducted by the Lead Agencies for this study found one minnow species, the comely shiner (*Notropis amoenus*), which had not recently been documented in the watershed. Game fish captured during sampling include brown trout (*Salmo trutta*), smallmouth bass, and largemouth bass. Trout are stocked by DNR in Northwest Branch, and in 2004 over 5,000 trout were released in March and April creating a popular put-and-take fishery. No anadromous fish were documented in Northwest Branch, as numerous migratory fish blockages exist downstream.

Paint Branch Watershed

The Upper Paint Branch watershed has some of the best overall aquatic conditions in the study area. The majority of the streams in the watershed are rated as "Good" or "Excellent" for their combination of high quality aquatic habitat, and diverse and sensitive benthic macroinvertebrate and fish communities. The streams benefit from substantial year-round baseflows from numerous seeps that help to provide both stable habitat and water temperatures. A number of the subwatersheds have relatively high impervious percentages, but still support high quality aquatic communities. This is perhaps due to these stabilizing baseflows as well as stormwater management retrofits of older communities, and stringent stormwater management guidelines for most new development.

Extensive information is available on the naturally reproducing population of brown trout in the Paint Branch watershed from Montgomery County and from several publications of the Maryland Department of Natural Resources studies conducted by Gougeon (1985, 1999-2003).

The best overall aquatic conditions are found in the Good Hope Tributary with the lower portions of Gum Springs and Right Fork Tributaries only slightly more impaired. While the uppermost portion of Good Hope Tributary shows signs of impairment from flow related issues, all parameters in the portion of the stream below Good Hope Road were consistently ranked as "Good" to "Excellent" over the ten years of monitoring. Ratings of "Fair" were recorded only during 2000. The following year, ratings returned to "Good" or "Excellent". Large cool-water baseflow inputs and relatively large areas of forested land use support the high quality of Good Hope Tributary. Impervious percentages in the subwatershed have just recently reached ten percent in 2001 (M-NCPPC, 2003), a development threshold beyond which stream degradation has been shown to substantially affect biological communities (Center for Watershed Protection, 2003).

The Gum Springs Tributary is also of very high quality, particularly in its lower reaches, despite relatively high impervious coverage of 15 percent (M-NCPPC, 2003). The upper portions of the stream are slightly more impaired (rated as "Fair"), but have improved greatly from 1994–1997 when pollutant inputs and lack of habitat for fish resulted in a poor fish community. The mainstem of the Right Fork Tributary was consistently rated as "Good" with the exception of a "Fair" benthic IBI in 2001. The most impaired conditions are found in Fairland Farms and Hollywood Branch Tributaries. The Hollywood Branch Tributary, which is outside the SPA, has a high impervious percentage (18%; MCDEP, 1998) and is in fair overall condition, though flashy flows, embeddedness and sedimentation have limited the biological communities to a rating of "Poor" in some years (MCDEP, 1998). Fairland Farms is also fair overall due to sedimentation (MCDEP, 1998).

Though not as high quality as the least-impaired tributaries in the watershed, the Upper Mainstem (12.9% impervious; M-NCPPC, 2003) is typically ranked as "Good" to "Excellent" in most years. Parameters and station results are more variable here, with no clear spatial or temporal trend. The Middle Mainstem is also variable, with "Good" to "Excellent" habitat and fish communities, but primarily fair macroinvertebrate communities. Uncontrolled runoff and consistent sedimentation problems were cited by MCDEP in 1998 as contributing to less than optimal aquatic conditions (MCDEP, 1998).

Twenty fish species have been documented in Paint Branch in recent years. This is one of the lowest overall species counts in the study area watersheds. This is potentially due to the relatively small drainage area of the streams in the study area, but is more likely related to the fact that much of the headwaters of the watershed are a coldwater fishery. Coldwater fisheries naturally have a lower species diversity than warm water streams, meaning that fewer species is not necessarily an indicator of degradation in these systems. From a fisheries perspective, Paint Branch is unique in the study area as well as the region because it supports a naturally reproducing population of brown trout. Overall, Paint Branch also has the highest quality fish community of all of the ICC project area watersheds, with most stations being rated as "Good" or "Excellent".

Paint Branch Trout

As discussed above, the Upper Paint Branch watershed, upstream of Fairland Road in Montgomery County, has long been viewed as one of the highest quality watersheds in the Washington Metropolitan area, largely because of its ability to sustain a naturally reproducing population of brown trout. It is believed that trout reproduction has been on-going in the Upper Paint Branch watershed since the late 1930s (Gougeon, 1985). DNR has been collecting annual data on the trout resource since 1979. Although brown trout are not a native species and originally were introduced into the system through stocking, their long-term presence and continued reproduction has been an indicator of the quality of the Upper Paint Branch system and a catalyst for protection of this sensitive resource.

On July 11, 1995 the Upper Paint Branch was designated by the Montgomery County Council as an SPA. The SPA designation allows the county to closely coordinate water quality protection of sensitive areas with land use controls and special development requirements (MCDEP, 2001).

From 1995 to the present, Montgomery County has continued to enhance protection of the resource with an ambitious land acquisition program, restoration projects, stormwater retrofits and an environmental overlay zone that, among other things, limits impervious surfaces in new development to ten percent. In addition, MCDEP joined DNR in 1994 in long-term monitoring of the resource. Because of its unique status, a great deal of data have been collected on the trout resource and conditions within the Upper Paint Branch by DNR, MCDEP and also by the Lead Agencies as part of ICC planning activities over the past two decades.

The Lead Agencies initiated its own study of the trout resource in 1995 and 1996 to supplement the available information. The study involved extensive analysis of the physical and geomorphic characteristics of the watershed; trout population dynamics such as size, distribution, reproduction and survival rates, role of the overall fish community; benthic macroinvertebrates; and temperature. Analyses were conducted from Fairland Road to the uppermost headwaters of the tributary streams.

Following the 1996 study, continued monitoring by DNR and MCDEP showed that trout populations remained relatively steady until 1998. However, a slight downturn in the number of trout captured in 1998 has since developed into a definitive decline in the resource as the region experienced severe and repeated droughts from 1999 through the end of 2002. Also during this period, watershed imperviousness increased in Good Hope Tributary above the 10 percent threshold generally believed to be critical in protecting the trout resource. After the record lows seen in the trout population in 2003, there are signs of improvement in the recent 2004 sampling, following two years of substantial rainfall. ***Tables II-14 and II-15*** list DNR trout monitoring results at stations in the Good Hope and Gum Springs tributaries from 1979 to 2004 and MCDEP's results at representative stream monitoring stations throughout Paint Branch from 1994 through 2004, respectively.

In summary, over two decades of study of Paint Branch and its trout population has determined that the resource is highly limited by the urban/suburban environment in which it is located. The trout population has existed within a particularly narrow threshold of success over the past two decades and recent data appears to confirm the resource's susceptibility to disturbance, whether from natural phenomenon such as drought or changes in the watershed. There were improvements in young of the year (YOY) recruitment in 2004, however, the long-term future of the resource is uncertain, making it clear that further watershed disturbances could have potentially harmful effects on what remains of the resource and could limit chances for long-term recovery from the unprecedented population declines experienced in the past few years. Local and State resource managers and regulators continue to monitor the resource and remain committed to its long-term protection as a high-quality system capable of supporting a diverse and sensitive biological community. More detailed information regarding the Paint Branch Trout Population, including the history of resource protection, monitoring, and trends is located in the *NETR, I-270 to US 1* (SHA, 2004).

Table II-14
DNR Long-Term Brown Trout Population Data for Good Hope and Gum Springs Tributaries[1]

Year	Good Hope Tributary Hobbs Drive Station[1]			Gum Springs Tributary Above Confluence with Paint Branch[2]		
	Lbs/acre	Trout/acre	YOY/acre	Lbs/acre	Trout/acre	YOY/acre
1979	84	286	696	n/s	n/s	n/s
1980	79	357	518	n/s	n/s	n/s
1981	61	357	196	n/s	n/s	n/s
1982	31	179	89	n/s	n/s	n/s
1983	28	125	357	n/s	n/s	n/s
1984	36	196	554	n/s	n/s	n/s
1985	65	339	500	n/s	n/s	n/s
1986	37	268	768	n/s	n/s	n/s
1987	49	258	179	n/s	n/s	n/s
1988	34	125	518	n/s	n/s	n/s
1989	35	232	232	8	27	9
1990	49	304	357	0	0	27
1991	28	196	268	0	0	161
1992	31	161	339	2	18	18
1993	23	179	911	1	9	277
1994	58	482	393	10	89	196
1995	43	304	393	2	18	27
1996	49	286	500	8	36	0
1997	82	482	607	1	9	27
1998	60	375	304	8	45	18
1999	35	268	393	n/s	n/s	n/s
2000	22	89	250	n/s	n/s	n/s
2001	21	143	268	0	0	214
2002	7	71	196	1	18	9
2003	13	71	0	10	18	0
2004	23	63	114	0	0	9

n/s denotes that station was not sampled in that year
[1]Station is 295 feet long
[2]Station is 518 feet long
Source: DNR Freshwater Fisheries Database

Table II-15
MCDEP Long-Term Brown Trout Data from Sampling Stations[1] in Paint Branch, 1994-2004

Station[1]	No.	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
PBRF117 (Right Fork)	Adults	1	N/S[2]	0	2	6	N/S	0	0	0	0	0
	YOY[3]	0	N/S	2	9	5	N/S	0	2	0	0	0
PBRF204 (Right Fork)	Adults	5	N/S	2	3	8	2	0	0	2	0	0
	YOY	5	N/S	2	7	4	1	0	0	0	0	0
PBRF206 (Right Fork)	Adults	N/S	N/S	N/S	N/S	2	N/S	0	0	N/S	N/S	0
	YOY	N/S	N/S	N/S	N/S	3	N/S	0	0	N/S	N/S	0
PBLF202 (Left Fork)	Adults	0	N/S	0	0	N/S	0	0	0	N/S	0	0
	YOY	0	N/S	0	0	N/S	0	0	0	N/S	0	0
PBLF203 (Left Fork)	Adults	2	N/S	0	0	N/S	0	0	0	N/S	0	N/S
	YOY	0	N/S	1	0	N/S	0	0	0	N/S	0	N/S
PBGS111 (Gum Springs)	Adults	7	N/S	0	0	2	1	1	0	2	N/S	N/S
	YOY	41	N/S	0	1	0	0	0	8	0	N/S	N/S
PBGS206 (Gum Springs)	Adults	10	2	4	0	2	N/S	0	0	1	1	0
	YOY	21	0	0	2	1	N/S	0	21	1	0	0
PBGH1108 (Good Hope)	Adults	2	2	1	0	N/S	0	0	N/S	N/S	N/S	N/S
	YOY	2	0	2	25	N/S	0	1	N/S	N/S	N/S	N/S
PBGH208A (Good Hope)	Adults	25	17	16	15	10	14	3	6	3	3	4
	YOY	21	0	0	18	10	18	8	12	7	0	3
PBPB302 (Mainstem)	Adult	2	N/S	1	2	6	1	1	N/S	N/S	0	0
	YOY	0	N/S	0	16	1	3	0	N/S	N/S	0	3
PBPB305 (Mainstem)	Adults	19	8	0	3	N/S	N/S	2	0	N/S	1	0
	YOY	6	0	0	5	N/S	N/S	0	8	N/S	0	4
TOTALS	Adults	73	29	24	25	36	18	7	6	8	5	4
	YOY	96	0	7	83	24	22	9	51	8	0	10

[1] All MCDEP stations are 75 meters in length
[2] N/S – Not Sampled
[3] YOY = Young-of-Year or that year's hatch
Source: MCDEP 2003 & 2004

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from the current breeding bird atlas project, M-NCPPC observations, MCDEP observations, direct observations by biologists conducting field work for the ICC project and previous studies conducted for the ICC.

10. Rare, Threatened, and Endangered Species

The following section identifies the Federally and State listed rare, threatened, and endangered (RTE) species potentially occurring within the project study area. It also addresses species considered to be of local significance.

a. Methods

The Lead Agencies sent correspondence to the USFWS, DNR, M-NCPPC, and a local botanist to inquire about the possibility of any State or Federal listed species inhabiting the project study area. In addition, the 1997 *NETR, I-270 to US 1* (SHA, 1997) was reviewed. From the correspondence, the bog turtle, bald eagle, two amphipods, and 22 plant species (***Table II-26 thru Table II-28***) were identified for which further investigations needed to be considered (*NETR*, SHA, 2004). Field surveys for those species, other than the bald eagle, were initiated during the fall of 2003 and were completed in September of 2004.

Coordination with Federal, State and local agencies is located in ***Appendix B*** and documents potential occurrences of rare, threatened or endangered species identified within the ICC study area.

Field surveys were conducted within potential habitats of RTE species following the DNR, Wildlife and Heritage Division's (WHD) rare plant survey protocol. The methodology consists of conducting a series of area surveys of properties with potential RTE habitat. In addition, plant surveys have also included verifying the location of species by conducting field surveys with a local botanist.

Surveys for plant species occurred during each plant's flowering period. For certain species, particularly woody species, surveys have been conducted throughout 2004. RTE species and habitats have been identified and located utilizing a GPS unit.

A comment received from the USFWS in the fall of 2003 alerted the Lead Agencies to the potential presence of two amphipod species in the project area: Federally-listed Hay's spring amphipod (*Stygobramus hayi*) and Federally-listed candidate Kenk's amphipod (*Stygobromus kenki*). Amphipod surveys began in the fall of 2003 and continued throughout the early spring of 2004. Survey efforts were closely coordinated with DNR including collection procedures (time of year for collecting, sampling locations, etc.). The surveys have consisted of identifying springs and seeps within the study area that are the required habitat for the species in question. Along each seep, any visible amphipods were collected within the first three feet of flow extending from the seep. Within the water column, other non-visible species were collected as well. Each collection was stored in a vial with ethanol and forwarded to DNR for review and identification by a trained specialist.

During the 1997 ICC NEPA efforts, there was discussion among the agencies and the public that the Federally-listed threatened bog turtle (*Clemmys muhlenbergi)* may have been identified within a wetland located in North Branch Rock Creek. As part of an effort to validate the potential finding, a comprehensive bog turtle survey, following both Federal (USFWS) and State (DNR) protocols, was conducted between April 15th and June 15th, 2004. The three criteria used to identify bog turtle habitat are hydrology, soils, and vegetation. Bog turtle habitat typically consists of spring-fed wetlands, with a soft muck or peat bottom, and shallow surface water. Typical bog turtle habitat vegetation includes low grasses and sedges. The wetland at North Branch Rock Creek potentially met the parameters of the three criteria listed above. Four bog turtle surveys were conducted during daylight hours, when air and water temperatures were over 55°F, and when cloud cover was less than 50 percent. Three people, including one recognized bog turtle surveyor, conducted the four surveys, for a minimum of three to six person-hours per acre of wetland. Any identified bog turtles were to be photographed and the following information collected: sex, carapace length-straight line, carapace width, weight, and presence of any scars or injuries. Additional details regarding this survey are located in the *NETR, I-270 to US 1* (SHA, 2004).

Regulations

Federal

The Endangered Species Act of 1973 (Section 7) was established to protect the habitat of endangered species and to help in the preservation and recovery of listed species. The law is administered by the USFWS and the National Marine Fisheries Service (NMFS). The USFWS is responsible for terrestrial and freshwater species, while the NMFS is responsible for the marine species.

Section 7 consultation is required under the Endangered Species Act for any Federal action that may take place within the habitat of any Federally-listed endangered, threatened, or candidate species. The required consultation ensures that actions taken by Federal agencies will not jeopardize the existence of any listed species. Agencies are encouraged to work in conjunction with the USFWS and the NMFS to plan or modify Federal projects to avoid or minimize impacts to listed species and their habitat. Through coordination, identification of species and informal resolution of potential conflicts can be resolved early in the planning process.

Section 6 of the Endangered Species Act encourages individual states to develop conservation programs for Federally-listed species. Federal financial assistance and incentives are provided to those states that develop such a program. Although the first priority of the USFWS is to conserve endangered and threatened habitat on Federal lands, many species occur on private lands. To encourage non-Federal landowners to manage their land to conserve species habitat, an incentive program has been developed that includes both financial and technical assistance. With such an incentive program, the private landowners interests are protected while still managing the land to benefit species.

The law established by the State of Maryland is described below.

Federal Status Designations

Species listed on the Federal lists can be classified as either endangered or threatened. Endangered means that a species is in danger of extinction throughout all or a significant portion of its range. Threatened means that a species is likely to become endangered within the foreseeable future. The Federal program also identifies candidate species for which proposals have been submitted for protection as a Federally-listed endangered or threatened species, however a final determination to list has not been made.

The following describes the various status of a species as determined by the USFWS, in accordance with the Endangered Species Act. Definitions of the following categories have been summarized from 50 CFR 17.

- C: Candidate taxa for listing for which the USFWS has on file enough substantial information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened
- LT: Taxa listed as threatened; likely to become endangered within the foreseeable future throughout all or a significant portion of their range
- LE: Taxa listed as endangered; in danger of extinction throughout all or a significant portion of their range

State

In the State of Maryland, the primary endangered species law is the Nongame and Endangered Species Conservation Act (Annotated Code of Maryland 10-2A-01). This law relates to Section 6 of the Endangered Species Act by protecting both Federally-listed endangered species and those species deemed State endangered, threatened, or in need of conservation within the State based on habitat and conservation factors. This law is supported by regulations set forth in Title 08.03.08 of the Code of Maryland Regulation (COMAR), which contains the official State list of species considered endangered, threatened, or in need of conservation (COMAR, 1985). The DNR is mandated under this law to maintain a list of species deemed to be endangered, threatened, or in need of conservation within the State. The Secretary of Natural Resources is required to establish conservation programs for these species. State agencies are required to help maintain and enhance populations of species, which are found to be endangered, threatened, or in need of conservation.

State Ranking/Status Designations

Species listed on the Maryland State endangered species list are classified by both rank and status by the DNR WHD. The definitions of State rank and State status for the species identified in this document are listed below (DNR[b], 2003).

State Rank

State ranked species with the highest ranks are those species that are the rarest and most at risk within the State. Some of these species are potential candidates for changes in their listing but require further investigation. Those species with ranks of either S1 or S2 are actively tracked by DNR-WHD. Based on the tracking efforts, if it is determined that sufficient information exists to suggest that the species is in further decline, a species may be given a State status (described below). Species with a S3 ranking are not actively tracked.

It should be noted that other agencies, including local governments, may actively track some species that DNR-WHD does not. These species considered to be of local significance, may or may not be actively tracked by DNR-WHD and typically are not afforded protection by DNR-WHD.

In general, ranked species without a status of endangered, threatened, or in need of conservation are not afforded protection by DNR-WHD.

The highest State ranks include:

- S1: Highly State rare - Critically imperiled in Maryland because of extreme rarity (typically 5 or fewer estimated occurrences or very few remaining individuals or acres in the State) or because of some factor(s) making it especially vulnerable to extirpation. Species with this rank are actively tracked by the WHD.
- S2: State rare - Imperiled in Maryland because of rarity (typically six to 20 estimated occurrences or few remaining individuals or acres in the State) or because of some factor(s) making it vulnerable to becoming extirpated. Species with this rank are actively tracked by the WHD.
- S3: Watch list - Rare to uncommon with the number of occurrences typically in the range of 21 to 100 in Maryland. It may have fewer occurrences but with a large number of individuals in some populations, and it may be susceptible to large-scale disturbances. Species within this rank are not actively tracked by the WHD.

State Status

Species with a status of endangered, threatened, or in need of conservation are provided protection under the Nongame and Endangered Species Conservation Act. The following describes the status of species of concern within the study area as determined by the DNR. Definitions for the following categories have been taken from COMAR 08.03.08 (1985).

- E: Endangered - A species whose continued existence as a viable component of the State's flora and fauna is determined to be in jeopardy
- T: Threatened - A species of flora or fauna, which appears likely, within the foreseeable future, to become endangered in the State

- I: In Need of Conservation - An animal species whose population is limited or declining in the State such that it may become threatened in the foreseeable future if current trends or conditions persist

b. Existing Conditions

Federally-Listed Species

Two Federally-listed species (the Hay's spring amphipod and the bog turtle) and one Federal candidate species (Kenk's amphipod) were possibly present in the study area and warranted further field investigation and impact assessment as described below. The bald eagle, described below, was not within the study area.

Table II-26 lists the Federal species that may be present within the study area. A more detailed description of each species is provided below.

Table II-26
Federally-Listed Species Possible in the Study Area

Listed Species		Habitat	Federal Status	Watershed
Common Name	**Scientific Name**			
Bog turtle	*Clemmys muhlenbergii*	Shallow swamps and sphagnum bogs with muddy bottoms.	(LT) Federal-Threatened*	North Branch Rock Creek
Hay's spring amphipod	*Stygobromus hayi*	Mud and leaf litter of cool, seep-like springs.	(LE) Endangered	Lower Rock Creek
Kenk's amphipod	*Stygobromus kenki*	Mud and leaf litter of cool, seep-like springs.	(C) Candidate Species	Lower Rock Creek

*The bog turtle is also listed as (S2/T) Imperiled / Threatened by the State of Maryland and thus is described further in later sections.
Note: Bald eagle, described below, is not within the study area.

Hay's spring amphipod
(*Stygobromus hayi*)

Hay's spring amphipod is an unpigmented, eyeless amphipod, which can grow up to one centimeter in size. It tends to inhabit the leaf litter and mud of cool, seep-like springs. This species is known to be present in lower Rock Creek Park within Washington, DC. There are no known locations for this species within the study area.

Kenk's amphipod
(Stygobromus kenki)

Kenk's amphipod has a similar appearance and habit to the Hay's spring amphipod, except it is smaller, measuring up to 0.6 centimeters. This species has been documented as having occurred in Rock Creek Park of Washington, D.C. There are no known locations for this species within the study area.

Surveys were conducted from late February through April of 2004 to determine the presence of either the Hay's spring or Kenk's amphipods along both corridors. Survey efforts were coordinated with DNR staff. Based on the surveys, there are no known locations for either species within the study area. Identification of all of the groundwater amphipod samples collected have been completed. Samples include a variety of different seep locations throughout the study area. For each of the locations, *Stygobromus tenius potomacus,* a relatively common amphipod specie, was the only *Stygobromus* specie identified. No State or Federally-listed threatened or endangered species were discovered during the sampling survey.

Bog turtle
(Clemmys muhlenbergii)

The bog turtle can be found sporadically between southern New England and northern Georgia. This species is semi-aquatic and inhabits shallow swamps and sphagnum bogs with muddy bottoms. The average weight of this species is four ounces and the average length is three to three and a half inches. Bog turtles feed on seeds, berries, insects, worms, frogs, and snails, and can live to an age of 40 years. There was suspected habitat for this species within the vicinity of where corridor cross North Branch Rock Creek (Wetland 1Y). The location was not considered to be part of the known range for this species within Maryland. However, there were concerns expressed by the public that the species may be present. In response to these concerns, four separate Phase II bog turtle surveys were conducted during the required survey period within Wetland 1Y. These surveys spanned from April 29, 2004 to June 4, 2004. The wetland is primarily forested with a dense skunk cabbage understory. Marginal bog turtle habitat exists within a small area, however; even within this area the substrate composition is generally not comprised of organic mucks preferred by bog turtles. No bog turtles were found within the marginal habitat or elsewhere. Reptiles that have been encountered during one or more of the surveys include box turtle (*Terrapene carolina*), snapping turtle (*Chelydra serpentina*), and spotted turtles (*Clemmys guttata*).

Bald Eagle
(*Haliaeetus leucocephalus*)

There is a known bald eagle nest located to the north, approximately one-half mile outside of the study area. A pair of eagles, which can live to 30 years of age, are known to occupy the nest. It is specifically located along the north side of Rocky Gorge Reservoir approximately one half mile from the closest alignment under consideration, Corridor 2, Burtonsville B (Station 755). Bald eagles are found in Maryland all year round and nest in 20 of Maryland's 23 counties. The most eagles are found along the Chesapeake Bay and its tributaries.

The bald eagle is currently listed as a threatened species under the ESA. In 1999, the USFWS began the formal process to remove the bald eagle from the Federally threatened list. The USFWS has been soliciting public comment on the de-listing. While nothing official has been reported at the time of this writing. The proposed de-listing does not affect the current review of this species, as the species was listed at the time the Federal review began and is presently listed. Based on ongoing coordination with both DNR and USFWS, no further investigations or analysis is required for this species. Distances over a quarter of a mile for a project such as

highway construction are considered out of the range for concern for both agencies. In addition, there is sufficient protected land between both the nest and the closest potential ICC corridor and option.

Other than the Federally-listed species above, no other State or Federally-listed animal species were identified through agency coordination for further investigation.

State Rare, Threatened, and Endangered Plant Species

State rare, threatened, or endangered species identified from DNR, other agencies or field investigations are limited to plant species. Plant species with either a State ranking (S1, S2, and S3) or status of endangered or threatened have been identified within close proximity to the proposed corridors. The identification and location of these species have been determined from several sources including:

Correspondence from DNR – The DNR-WHD maintains a list of geographic areas, known as Ecologically Significant Areas (ESAs), which typically contain RTE species. The DNR-WHD has provided a list of known ESAs within the study area. In most cases, a plant species is associated with the ESA. The ESA includes a buffer surrounding the approximate limits of the habitat associated with a species. DNR has stressed the importance of preserving these habitats in order to best protect the species associated with the habitat.

It should be noted that the ESAs only represent the data currently maintained by DNR. Other species may be present in the ESA or there may be species present that DNR does not actively track. Many of these species are described in this section.

Previous studies by others – A number of plant species identified within this document are from other reports and the field efforts associated with others. Reports include the 1997 *ICC DEIS* (SHA, 1997) and natural resource inventory reports conducted by DNR (funded by M-NCPPC) for several park systems throughout the study area. In addition, discussions with a local botanist have occurred to determine the location of many species. In some cases, field visits with the botanist have been conducted to best determine the exact location for each species.

Field surveys - Field investigations within close proximity of the proposed corridors were conducted from September 2003 through September 2004 to determine both the exact location(s) of State species and to identify the presence of other listed species that had not been previously recorded.

Other potential RTE species within the vicinity of the proposed alignments identified by sources other than DNR are also described in this section. These species were determined either from existing literature, interviews with a local botanist, or field investigations during the fall of 2003 through spring and summer of 2004. A description of the species associated with each ES Area and those species identified from other sources is provided below.

State Rare, Threatened, and Endangered Plants – Specific Records and Known Locations

In addition to the five species found in the ESAs provided by DNR (American chestnut, bashful bulrush, butternut, wooly sedge, featherbells, and halberd-leaved greenbrier), there are other State listed plant species (***Tables II-27 and II-28***) that have been identified as occurring within close proximity to the alignments. In many cases, these species are located within an ESA.

Table II-27 presents the State-listed plant species considered by DNR's Wildlife and Heritage Service to be either endangered or threatened that are in close vicinity to the proposed corridors. These species are associated with either an ESA or identified from other sources. These are species which are afforded protection.

Table II-27
State Threatened, or Endangered Plant Species Habitat in the Study Area

Species of Concern		Habitat	State Rank / State Status	Watershed
Common Name	Scientific Name			
Featherbells	*Stenanthium gramineum*	Thin woodlands, cut-over woodland borders and meadows, usually in small colonies (Radford et al., 1968); emergent wetlands, open sphagnous swales, seepage swamps, moist thickets, floodplain (rarely upland) forests (MDNHP).	S1/Threatened	Paint Branch
Halberd-leaved greenbrier	*Smilax pseudochina*	Moist sandy soil (Tatnall, 1946); sphagnous swales, bogs, borders of low woods or damp sands (Fernald, 1950).	S2/Threatened	Little Paint Branch Indian Creek
Rough-leaved aster	*Aster radula*	Bogs, swamps, stream banks, chiefly in mountains.	S1/Endangered	Indian Creek
Trailing stitchwort	*Stellaria alsine*	Swamps, marshes and streambanks	S1/Endangered	North Branch Rock Creek

Table II-28 presents the State-listed rare (S2), watchlist (S3), and uncommon locally significant and uncommon plant species occurring within close proximity to the proposed alignments. The majority of the species have a State ranking of either State rare (S1, S2) or watchlist (S3). In addition, there are multiple populations for many of these species throughout the proposed alignments. In some cases, species have been included in the table below that do not have a State ranking (no current listing) but have been identified as being of a local significance by M-NCPPC who has requested that these local species also be considered as part of the FEIS. .

The species that are considered to be State watchlist or of local significance are not necessarily be considered for protection under Annotated Code of Maryland regulations. A more detailed description of each species can be found in the *NETR* (SHA, 2004).

Table II-28

*State Rare (S2), Watchlist (S3), or Locally Significant Species Habitat in the Study Area**

Species of Concern		Habitat	State Rank	Watershed
Common Name	**Scientific Name**			
American chestnut	*Castanea dentata*	Wet soils of low woods and open uncultivated fields. Rich woods (Radford et al., 1968); dry, rich, usually acid, gravelly or rocky ground, often of uplands (Hough, 1983).	S2S3	Rock Creek Northwest Branch Paint Branch
Bashful bulrush	*Scirpus verecundus*	Dry woods and clearings (Fernald, 1950); rocky woods (Strausbaugh & Core, 1978).	S2S3	Rock Creek Paint Branch
Butternut	*Juglans cinerea*	Rich woods and river terraces (Fernald, 1950).	S2S3	Northwest Branch
Carolina leaf-flower	*Phyllanthus caroliniensis*	In poor dry soils.	S3	Northwest Branch
Carolina tassle-rue	*Trautvetteria caroliniensis*	Stream banks and wooded areas.	S3	Rock Creek
Chinquapin chestnut	*Castanea pumila*	Moist, well-drained soils.	No State Listing (Locally Significant)	Rock Creek Northwest Branch Paint Branch
Chinquapin oak	*Quercus muehlenbergii*	Dry woods and limestone soils (Petrides, 1986).	No State Listing (Locally Significant)	Rock Creek
Low bindweed	*Calystegia spithamaea*	Fields, roadsides and calcareous slopes (Fernald, 1950); dry, rocky, or sandy soil, fields and open woods (Gleason & Cronquist, 1991).	S2	North Branch Rock Creek
Pubescent sedge	*Carex hirtifolia*	Dry to moist woods/fields.	S3	Rock Creek
Purple sneezeweed	*Helenium flexuosum*	Damp meadows, thickets, and roadsides.	No State Listing (Locally Significant)	Northwest Branch
Rough avens	*Geum laciniatum*	Moist soils and marshes.	S3	Northwest Branch
Shingle oak	*Quercus imbricaria*	Streams or river banks.	No State Listing (Locally Significant)	Rock Creek North Branch Rock Creek Northwest Branch Paint Branch
Showy skullcap	*Scutellaria serrata*	Rich upland woods.	S3	Rock Creek Northwest Branch

Table II-28

*State Rare (S2), Watchlist (S3), or Locally Significant Species Habitat in the Study Area**

Species of Concern		Habitat	State Rank	Watershed
Common Name	**Scientific Name**			
Small's ragwort	*Senecio smallii*	Roadsides and outcrops.	No State Listing (Locally Significant)	Rock Creek Northwest Branch Paint Branch
Tall boneset	*Eupatorium altissimum*	Wet soils of low woods and open uncultivated fields.	S3	Northwest Branch
Umbrella magnolia	*Magnolia tripetala*	Rich mesic woods.	S3	Northwest Branch
Virginia snakeroot	*Aristolochia serpentaria*	Forest and dry woods.	No State Listing (Locally Significant)	Rock Creek Northwest Branch Paint Branch
Woolly sedge	*Carex pellita*	Rich meadows, swales and shores (Fernald, 1950); meadows and swamps (Tatnall, 1946).	S2	Northwest Branch

*Not protected by State law.

State Threatened Fish Species

The ICC study team recently identified a fish species within the ICC study area currently considered State threatened by DNR. The team identified the comely shiner in Northwest Branch just below Bonifant Road and in Little Paint Branch tributary in September 2003 during the ICC surveys. Realizing that it was uncommon, a voucher specimen was collected in the field and was taken to the DNR Maryland Biological Stream Survey for verification. While this species was noted as uncommon in the *NETR, I-270 to US 1*, the species was not identified as being considered a State threatened species in the DEIS or *NETR, I-270 to US 1*. DNR records do not list this species as State threatened until December 2003. ICC Correspondence from State agencies does not include this species as State threatened. The comely shiner has been identified by local agencies in two other locations including along the Corridor 1 crossing for Northwest Branch. Another location is upstream of the Little Paint Branch - Greencastle Tributary.

The habitat for the comely shiner has been consistently described as warm water, medium to large streams and rivers with a low to moderate gradient. It can be found over a variety of substrates but is mostly found in slow runs and pool sections adjacent to moderate currents. The global range for this species is mostly restricted to the Atlantic slope drainage in the Upper Coastal Plain, Piedmont, and Ridge and Valley physiographic regions from New York to North Carolina. In Maryland, this species has undergone severe population declines and nearly 70 percent of its occurrences are now historical. Most of those are actually considered to be extirpated based on recent survey data. As a result, this species is officially listed in COMAR as being threatened in the State of Maryland.

Ecologically Significant Areas (ESAs)

Ecologically Significant Areas (ESAs) are specific geographic areas that may contain either State or Federally-listed RTE species that have been identified by DNR. However, within the ICC study area, all species of interest are State-listed plants. The data on these sites was provided in digital form from DNR. These data provide an approximate location of all State regulated and designated areas involving sensitive and listed species, but does not provide specific information regarding the site. These ESAs require further field verification and agency coordination prior to any corridor development. Additional information about the ESAs within the study area, including the species contained within, was obtained through further coordination with DNR.

The ESA protection boundary represents the approximate habitat limits associated with a species that may be within the ESA. Potential impacts to the ESA are an important consideration in the overall protection of any RTE species inhabiting the ESA. In some cases, ESAs are not affiliated with a particular species, such as Aitcheson Bog (described below) but instead may serve as a protection boundary for a rare or unusual habitat or plant community such as a wetland.

Fourteen ESAs are located within the boundary of the study area. Five of these ESAs are located within close proximity to the ROW and were therefore studied in detail and are presented by watershed below (***Figure II-19***). These ESAs include Redland Spring, Northwest Branch – Bonifant Floodplain, Spencerville Seeps, McKnew Bog, and Aitcheson Bog. Nine of these ESAs are located approximately 4,000 feet or more far enough away from the actual ROW of the and therefore did not warrant any detailed study. The ESAs not requiring further study include Puller Marsh (Rock Creek watershed), Lake Frank Area (North Branch Rock Creek watershed), Northwest Branch Fall Line and Northwest Branch-Randolph Floodplain (Northwest Branch watershed), Powder Mill Bogs (Paint Branch watershed), Sellman Road Powerline Site and Route I-95 Bogs (Little Paint Branch watershed), Ammendale West Bog (Indian Creek watershed), and Browns Bridge Crossing (Rocky Gorge watershed).

The ESAs located closer to the corridors and therefore studied in further detail are presented below by watershed. The ESAs included are Redland Spring, Northwest Branch – Bonifant Floodplain, Spencerville Seeps, McKnew Bog, and Aitcheson Bog (***Figure II-19***).

It is important to note that the species listed below are associated with ESAs and are just those species currently within DNR files.

Upper Rock Creek Watershed

Redland Spring

The Redland Spring ESA is located in Montgomery County, to the west of the intersection of Shady Grove Road and Corridors 1 and 2. Based on information from DNR, this 37.9-acre ESA contains known habitat for American chestnut (*Castena dentata*, State rare/watchlist) and bashful bulrush (*Scirpus verecundus*, State rare/watchlist). There are no State endangered or threatened species within the ESA. This area is also FIDS habitat, featuring mature forest dominated by red maple and other species of deciduous trees.

Northwest Branch Watershed

Northwest Branch - Bonifant Floodplain

The Northwest Branch - Bonifant Floodplain ESA is located in Montgomery County, southeast of the intersection of Corridor 1 and Bonifant Road. This 95.0-acre ESA contains known habitat, based on DNR data, for butternut (*Juglans cinerea*, State rare/watchlist) and woolly sedge (*Carex pellita*, State rare). There are no State endangered or threatened species within the ESA.

This area consists mainly of bottomland habitat with an adjacent large upland ridge. Dominant species within this mature forest are sycamore, red maple, tulip poplar, and white oak.

Paint Branch Watershed

Spencerville Seeps

The Spencerville Seeps ESA is located in Montgomery County between MD 650 and US 29. Based on information solely from DNR, this 17.3-acre ESA contains known habitat of featherbells (*Stenanthium gramineum*, threatened). Featherbells is listed as a State threatened species.

Little Paint Branch Watershed

McKnew Bog

The McKnew Bog ESA is located in both Montgomery and Prince George's Counties, south of MD 198 and west of I-95. According to DNR, this 216.6-acre ESA contains known habitat of halberd-leaved greenbrier (*Smilax pseudochina*, threatened), a State threatened species. Located in Fairland Regional Park, this area is dominated by upland ridges and slopes. Canopy coverage consists of mixed deciduous and coniferous forests. The majority of this ESA is located in the Little Paint Branch watershed.

Indian Creek Watershed

Aitcheson Bog

The 33.9-acre Aitcheson Bog ESA is located west of I-95 in Prince George's County, near the intersection of Corridor 1 and I-95. This ESA has been identified by DNR as an area with a unique wetland community.

McKnew Bog

The southern edge of the McKnew Bog, described above, is also located within the Indian Creek watershed.

Rocky Gorge Watershed

McKnew Bog

The northern edge of the Mcknew Bog, described above, is located within the Rocky Gorge watershed.

Upper Patuxent River Watershed

McKnew Bog

The eastern edge of the McKnew Bog, described above, is located within the Upper Patuxent River watershed.

11. Montgomery County Unique and Sensitive Areas

a. Methods

The M-NCPPC has surveyed within the study area and made special designations for certain areas which contain several unique and sensitive areas including: streams and buffers, 100-year floodplains, RTE habitats, steep slopes, and other areas in need of protection. Additional specially designated areas include ESAs, which were described above. Other areas, such as non-tidal Wetlands of Special State Concern, were also considered, however none were in close proximity to the corridors. Three types of special designations are found within the study area: Special Protection Areas (SPAs), Biodiversity Areas, and Best Natural Areas. Three separate surveys were conducted by the M-NCPPC to identify and evaluate the Biodiversity Areas within Montgomery County. The findings of the surveys were published in three reports dated 1993, 1997, and 1999. Additional surveys were conducted to evaluate the Best Natural Areas within the County. The findings from these surveys were provided through correspondence with M-NCPPC.

b. Existing Conditions

Special Protection Areas

SPAs are areas within a watershed that have high quality water resources and related natural features, such as streams or wetlands, which are planned for development densities that may threaten the quality of those resources. These watersheds need special protection measures beyond existing laws and regulations to ensure that their high quality will be maintained. Special protection measures within these areas are applied to new development and land use redevelopment. The Montgomery County Council is responsible for determining which areas within the county attain SPA status and where implementing overlay zones are applied.

The two SPAs located within the study area are the Upper Rock Creek SPA and the Upper Paint Branch SPA (***Figure II-19***). The Upper Rock Creek SPA is located in central Montgomery County southwest of MD 108. The Upper Paint Branch SPA is located in eastern Montgomery County west of US 29.

Several regulations and guidelines have been established for land development projects within SPAs. The Montgomery County Department of Environmental Protection is responsible for implementing a stream monitoring program within the watershed before, during, and after each development project that takes place in the SPA. Multiple resource agencies review the project as it progresses and look for ways to minimize environmental damage. The Departments of Environmental Protection and Permitting Services are responsible for jointly preparing a conservation plan for each SPA. The conservation plan identifies and describes the condition of each major water resource within the SPA. An annual report that discusses the current and past development projects and the results of the stream monitoring for each project is also required.

Land developers are responsible for incorporating mitigation measures structures, such as sediment and erosion control structures, SWM facilities, and protection of natural area buffers, into the design of the development project. In order to develop land within an SPA, projects must meet Montgomery County SPA regulations and guidelines as described in Chapter 19, Section 19-62.C of the Montgomery County Code. Projects must also conform to the requirements of the an applicable Environmental Overlay Zone (Section 59-C-18) of the Montgomery County Code. Before a project can proceed, the developer is required to submit a water quality plan that must be approved by both the Montgomery County Department of Permitting Services and the Montgomery County Planning Board. The water quality plan must describe how watershed protection goals will be met. Meeting these goals consists of evaluating the areas described below.

- *Site Imperviousness* – Paving, rooftops and compacted surfaces that preclude infiltration of water into the soil are to be minimized. Each SPA has different limits and exemptions set by the overlay zones (see discussion below.)

- *SPA Environmental Buffers* – Environmental buffers, protected by conservation easements or park dedication, are required around streams, wetlands, seeps, springs, and floodplains. Projects must be modified to avoid encroaching upon these environmental buffer areas. A buffer may be disturbed only if a waiver is granted by the Planning Board.

- *Stormwater Management Measures* – SWM structures that meet the goals set forth in the water quality plan must be incorporated into the design of the development project. These could include one or more of the following goals: maintaining stream base flow; maintaining stream temperatures; and protecting seeps, springs, and wetlands from erosive stormwater runoff.

- *Sediment and Erosion Control Measures* – Sediment and erosion control structures are required to be built before any land clearing or grading activities occur in order to prevent the sediment loaded runoff from entering the surface water resources during construction. These structures must meet the goals set forth in the water quality plan.

- *Water Quality Monitoring* – The developers are required to monitor runoff from the development before, during and after construction.

- *Forest Conservation Requirements* – In addition to standard requirements of the County Forest Conservation law and regulations, the entire environmental buffer must be retained or planted in forest and any forest planting must be done as soon as possible after grading permits are issued. Maintenance is required for five years with emplasis placed on control of invasive species.

Upper Paint Branch

Upper Paint Branch Special Protection Area

The Upper Paint Branch watershed is defined as the entire watershed north of Fairland Road. On July 11, 1995, the Upper Paint Branch was designated as a SPA by the Montgomery County Council designated the Upper Paint Branch as a SPA. Within this SPA, additional restrictions are in place for new development and the addition of impervious surface. In order to develop land within the Upper Paint Branch SPA, projects must meet Montgomery County SPA regulations and guidelines as described in Chapter 19, Section 19-62.C of the Montgomery County Code. Projects must also conform to the requirements of the environmental overlay zone (Section 59-C-18.15) of the Montgomery County Code. Before a project can proceed, the developer is required to submit a water quality plan that must be approved by both the Montgomery County Department of Permitting Services and the Montgomery County Planning Board. The water quality plan must describe how watershed protection goals will be met. Meeting these goals consists of evaluating the four areas described below.

Upper Paint Branch Environmental Overlay Zone

In addition to the SPA law and regulations, land development in the Upper Paint Branch is also subject to an environmental overlay zone as designated by M-NCPPC. An environmental overlay zone is part of the Montgomery County Zoning Ordinance and prohibits certain land uses so as to protect the natural resources in the watershed. The areas protected under the overlay zone include the subwatersheds of Good Hope, Gum Springs, Right Fork and Left Fork, and the segment of the main stem of Paint Branch north of Fairland Road. The Upper Paint Branch environmental overlay zone was established to:

- Protect the water quality and quantity of the Upper Paint Branch watershed and its tributaries, as well as the biodiversity situated in these resources.

- Regulated the amount and location of the impervious surfaces in order to maintain levels of groundwater and control erosion, and allow the ground to filter water naturally and control temperature.

- Regulate land uses that could adversely affect this very high quality, cold water stream resource that is afforded the highest order of resource protection (Use III Waters) under the State of Maryland's watershed designation system.

Impervious surface in a land development project within the Upper Paint Branch SPA cannot exceed 10 percent of the total development area. On a case-by-case basis, for public projects, the project layout, or land that is outside the development site but in the SPA may be purchased for conservation of pervious area to reduce a project's imperviousness. If impervious surface exceeds the 10 percent limit, the project must request a waiver. The waiver requires approval by the Director of the Department of Permitting Services or Planning Board, depending on the type of project.

Within the environmental overlay zone, several land uses are either regulated or prohibited. Regulated land uses include the use of land for landscape contracting, retail nursery or garden centers, wholesale nurseries or greenhouses, golf courses and country clubs, golf driving ranges, and riding stables. Land uses prohibited within the overlay zone include the use of land for airstrips in common open spaces, helistops, pipelines, automobile filling stations, automobile fluid maintenance stations, and automobile repair and services. In addition, a ten percent imperviousness limit is applied to land development projects.

Upper Rock Creek

Upper Rock Creek Special Protection Area

The Montgomery County Council voted on February 24, 2004, to designate Upper Rock Creek as a SPA in the Upper Rock Creek Area Master Plan. This designation covers the area of Upper Rock Creek included within the planning boundaries above Muncaster Mill Road (***Figure II-19***). The Planning Board discussed giving an SPA designation to the remaining portion of North Branch Rock Creek but did not recommend expansion of the SPA to the County Council. The County Council continued discussions as part of the adoption of the Olney Master Plan and on March 15, 2005, voted to extend the SPA boundaries to include the Norbeck Country Club property and the headwaters of the North Branch and Mainstem north of 108 and west of Reddy Branch Stream Valley Park. An environmental overlay zone also applies to development in Upper Rock Creek SPA (Section 59-C-18.24 of Montgomery County Code).

Upper Rock Creek Environmental Overlay Zone

In addition to the SPA law and regulations, land development in the Upper Rock Creek SPA is also subject to an environmental overlay zone. An environmental overlay zone is part of the Montgomery County Zoning Ordinance and limits imperviousness to protect the natural resources in the watershed. The areas protected in the overlay zone are the same as the SPA. The Upper Rock Creek environmental overlay zone was established to:

- Protect the water quality and quantity of the Upper Rock Creek watershed and its tributaries, as well as the biodiversity situated in these resources.
- Regulate the amount and location of the impervious surfaces in order to maintain levels of groundwater and control erosion, and allow the ground to filter water naturally and control temperature.

New development in the SPA that is served by community sewer is limited to 8 percent imperviousness. Expansion of existing uses is limited to 8 percent or the existing imperviousness (if it already is greater than 8 percent). Development (including public projects) not served by public community sewer or zoned for commercial or industrial uses is exempt from the overlay zone limits.

Biodiversity Areas

The M-NCPPC has identified several areas within the Montgomery County Park System known as Biodiversity Areas. These are areas which contain at least one of the following features: RTE plant or animal species, watchlist species, or those species having a high local importance, unique or unusual habitat areas; or natural communities of high quality or significance.

Seventeen designated Biodiversity Areas are located within the study area (***Figure II-19***). Of these, nine are within close proximity to either corridor. These include Needwood North, Crabbs Branch, North Branch, Lake Frank, Bonifant Meadows, Bonifant, Randolph Meadows, Good Hope, and Oursler Road (***Table II-29***). These Biodiversity Areas contain State RTE or watchlist species. Several of the RTE species within the biodiversity areas will not be impacted because of their distance from the corridors; therefore, these species were not studied in further detail and are not discussed in ***Chapter II.E.11.b***. Additional information on the biodiversity areas can be found in the *NETR, I-270 to US 1* (SHA, 2004).

Table II-29
Biodiversity Areas in the Study Area

Biodiversity Area	Year Designated	Species Identified	Primary Threats
Needwood North	1993	rough avens (*Geum laciniatum*) pubescent sedge (*Carex hirtifolia*) American chestnut (*Castanea dentata*) Virginia snakeroot (*Aristolochia serpentaria*) chinquapin chestnut (*Castanea pumila*) shingle oak (*Quercus imbricaria*) chinquapin oak (*Quercus muehlenbergii*) Small's ragwort. (*Senecio smallii*) bashful bulrush (*Scirpus verecundus*)	roadway construction, invasive non-native weed populations, large deer population, recreational use, development
Crabbs Branch	1997	green dragon (*Arisaema dracontium*) whorled coreopsis (*Coreopsis verticillata*) rough avens (*Geum laciniatum*) shingle oak (*Quercus imbricaria*)	invasive non-native weed populations, large deer population, recreational use, development
North Branch	1997	Virginia snakeroot (*Aristolochia serpentaria*) chinquapin chestnut (*Castanea pumila*) shingle oak (*Quercus imbricaria*) showy skullcap (*Scutellaria serrata*)	invasive non-native weed populations, large deer population, recreational use, development, disturbances to soil or forest canopy

Table II-29
Biodiversity Areas in the Study Area

Biodiversity Area	Year Designated	Species Identified	Primary Threats
Lake Frank	1993	shingle oak (*Quercus imbricaria*) toothcup (*Rotala ramosior*) water stargrass (*Heteranthera dubia*) swamp loosestrife (*Lysimachia terrestris*) false pimpernel (*Lindernia dubia*) variable pondweed (*Potamogeton diversifolius*) ditch stonecrop (*Penthorum sedoides*) stellate sedge (*Carex radiata*) crested iris (*Iris cristata*) American chestnut (*Castanea dentata*) narrow mannagrass (*Melica mutica*) Virginia snakeroot (*Aristolochia serpentaria*) shingle oak (*Quercus imbricaria*) low bindweed (*Calystegia spithamaea*)	invasive non-native weed populations, large deer population, recreational use, development, disturbances to forest canopy
Bonifant Meadows	1997	butternut (*Juglans cinerea*) rough avens (*Geum laciniatum*) purple sneezeweed (*Helenium flexuosum*) Carolina leaf-flower (*Phyllanthus caroliniensis*) shingle oak (*Quercus imbricaria*)	roadway construction, invasive non-native weed populations, large deer population, succession of old field habitat to forest
Bonifant	1997	butternut (*Juglans cinerea*) Virginia snakeroot (*Aristolochia serpentaria*) tall boneset (*Eupatorium altissimum*) shingle oak (*Quercus imbricaria*) showy skullcap (*Scutellaria serrata*) Small's ragwort (*Senecio smallii*)	roadway construction, invasive non-native weed populations, large deer population, succession of old field habitat to forest
Randolph Meadows	1993	shingle oak (*Quercus imbricaria*) butternut (*Juglans cinerea*) pale green orchid (*Platanthera flava*) purple fringeless orchid (*Platanthera peramoena*) ginseng (*Panax quinquefolius*) showy skullcap (*Scutellaria serrata*)	frequent flooding of Northwest Branch, high sediment runoff, invasive non-native weed populations, large deer population, recreational use, development, disturbances to soil or forest canopy
Good Hope	1997	Virginia snakeroot (*Aristolochia serpentaria*) chinquapin chestnut (*Castanea pumila*) Small's ragwort (*Senecio smallii*)	roadway construction, invasive non-native weed populations, large deer population, development, succession of natural habitat
Oursler Road	1999	chinquapin chestnut (*Castanea pumila*)	invasive non-native weed population large deer population

[1] *Inventory for Rare Plants and Significant Habitats on M-NCPPC Park Lands in Montgomery County, Maryland* (1999).

Best Natural Areas

Areas of high quality natural land within the Montgomery County parks system have been designated by M-NCPPC as Best Natural Areas. Areas receive this designation for containing large acres of high quality, contiguous forest; RTE plant species; Biodiversity Areas; unique plant and wildlife habitat; high quality wetlands; good aquatic biological areas; or special trout management areas.

Two Best Natural Areas are located within the study area; North Branch Stream Valley Unit Two and Upper Paint Branch Stream Valley Park (***Figure II-19***). These Best Natural Areas

contain State RTE or watchlist species. Several of the RTE species within the Best Natural Areas will not be impacted because of their distance from the corridors; therefore, these species were not studied in further detail.

North Branch Stream Valley Park Unit Two Best Natural Area

North Branch Stream Valley Park Best Natural Area includes all of the park property north of Muncaster Mill Road (Stream Valley Unit 2), and the forested wetlands adjacent to the stream south of Norbeck Country Club (Stream Valley Unit 3).

This Best Natural Area contains high quality mixed deciduous forest and high quality forested wetlands. Located in the parkland are several uncommon to rare species, including American chestnut, balsam ragwort (*Senecio pauperculus*), Virginia snakeroot, chinquapin, shingle oak, and showy skullcap.

Upper Paint Branch Stream Valley Park Best Natural Area

Upper Paint Branch Stream Valley Park Best Natural Area includes all of the park property north of Fairland Road. This consists of Good Hope tributary, the mainstem and right fork of Paint Branch, the left fork of Paint Branch to Hopefield Road, and Gum Springs tributary to Briggs Chaney Road and Good Hope Road.

This Best Natural Area contains the headwater tributaries to Paint Branch, which support a variety of aquatic species including the spawning brown trout populations. These tributaries supply cold water to the mainstem of Paint Branch. This parkland also includes upland forests dominated by oaks and tulip poplar (*Liriodendron tulipifera*), and numerous wetlands. Three uncommon to rare species were identified in this area: Virginia snakeroot, chinquapin, and Small's ragwort.

The *Inventory for Rare Plants and Significant Habitats on M-NCPPC Park Lands in Montgomery County, Maryland* (1999) provided detailed information on locally significant habitats and the potential for disturbance from land use changes.

F. Existing Noise Environment

1. Highway Noise Fundamentals

The decibel (dB) is the basic unit of sound measurement. Decibels are units that represent relative acoustic energy intensities. Because the range of energy found throughout the spectrum of normal hearing is so wide, the numbers necessary to define these levels must represent huge variations of energy. To compensate for this wide range of numbers, a base 10 logarithmic scale is used to make the numbers more understandable.

Traffic noise is the sound generated by vehicles on streets and highways. The sound generated is composed of tire, engine, and exhaust noise. People respond differently to sound energy in varying acoustic frequency ranges. A method of correlating human response to equivalent sound pressure levels at different frequencies is called "weighting".