E. TOPOGRAPHY, GEOLOGY, AND SOILS

1. Topography, Geology, and Soils

a. Existing Conditions

Topography

The topography of the I-270/US 15 Corridor is characterized by a level floodplain within the Monocacy Valley in the north through rolling terrain in the south. Elevations range from about 240 feet at the Monocacy River rising to 650 feet between Comus Road and MD 121. The I-270/US 15 Corridor traverses areas where existing terrain exceeds slopes of 15 percent or more. These areas generally occur where the landform descends to the floodplain of broad stream valleys.

Geologic Formations

The project extends from southeast to northwest through much of the Piedmont physiographic province. The Piedmont lies west of the Coastal Plain province and east of the Blue Ridge province. The east edge of the Blue Ridge province is Catoctin Mountain, just northwest of the I-270/US 15 Corridor. The western edge of the Piedmont province within the Corridor is comprised of the Frederick Valley, which includes the Monocacy River floodplain. This area is generally underlain be limestone and dolomite, which are not very resistant to erosive forces. Several dike structures, or cracks in the rock that have been filled with melted rock (magma), exist in this area. This solidified magma is referred to as diabase, which is similar to basalt. The thicker dikes often produce low ridges throughout the valley. The remainder of the I-270/US 15 Corridor is composed of bedrock formed from metamorphic processes in the Paleozoic age. The assemblage of rock types is heterogeneous and ranges from coarse-grained gneiss to fine grained schistose rocks known as phyllite.

Most of the rocks and geologic formations along the I-270/US 15 Corridor formed through high heat and pressure, which have intensely folded and faulted. The segment of the I-270/US 15 Corridor that starts at Shady Grove and cuts through Gaithersburg contains the Sykesville Formation, Morgan Run Formation, and Conowingo Diamictite. Each of the formations is layered on top of one another, with the Conowingo Diamictite being the youngest in the series. All formations consist of a mixture of sediments, schists, and ultramafic rocks. This mixture is due in most part to underwater landslides that were triggered by plate movement that occurred during the Ordovician period, which explains why pieces of the oceanic crust can be found in the Sykesville Formation.

Moving northwest along the I-270/US 15 Corridor to the edge of the Monocacy River, seven geologic formations occur from oldest to youngest: Marburg Formation, Cash Smith Formation, Araby Formation, Ijamsville Formation, Urbana Formation, Gillis Formation, and Sams Creek Formation. Shearing or tearing forces probably caused by thrust fault motions created most of these formations.

Grove and Frederick Limestone underlie the last section of the Corridor, which crosses the Monocacy River and connects with US 15. These limestones were formed from a carbonate bank that developed during early Cambrian time and continued to accumulate and thicken into the Ordovician time. As the bank extended seaward, the small fluctuations in water levels created conditions in which limestone could form.

The nature of the geologic formations found along the Corridor affects processes such as erosion and surface and groundwater flow. Most of the metamorphic rocks in the Piedmont have the same resistance to erosion. However, the areas underlain by limestones, such as the Frederick Valley, are not particularly resistant. The streams along the Corridor cut steep valleys and could cause more erosion if urbanization were to increase.

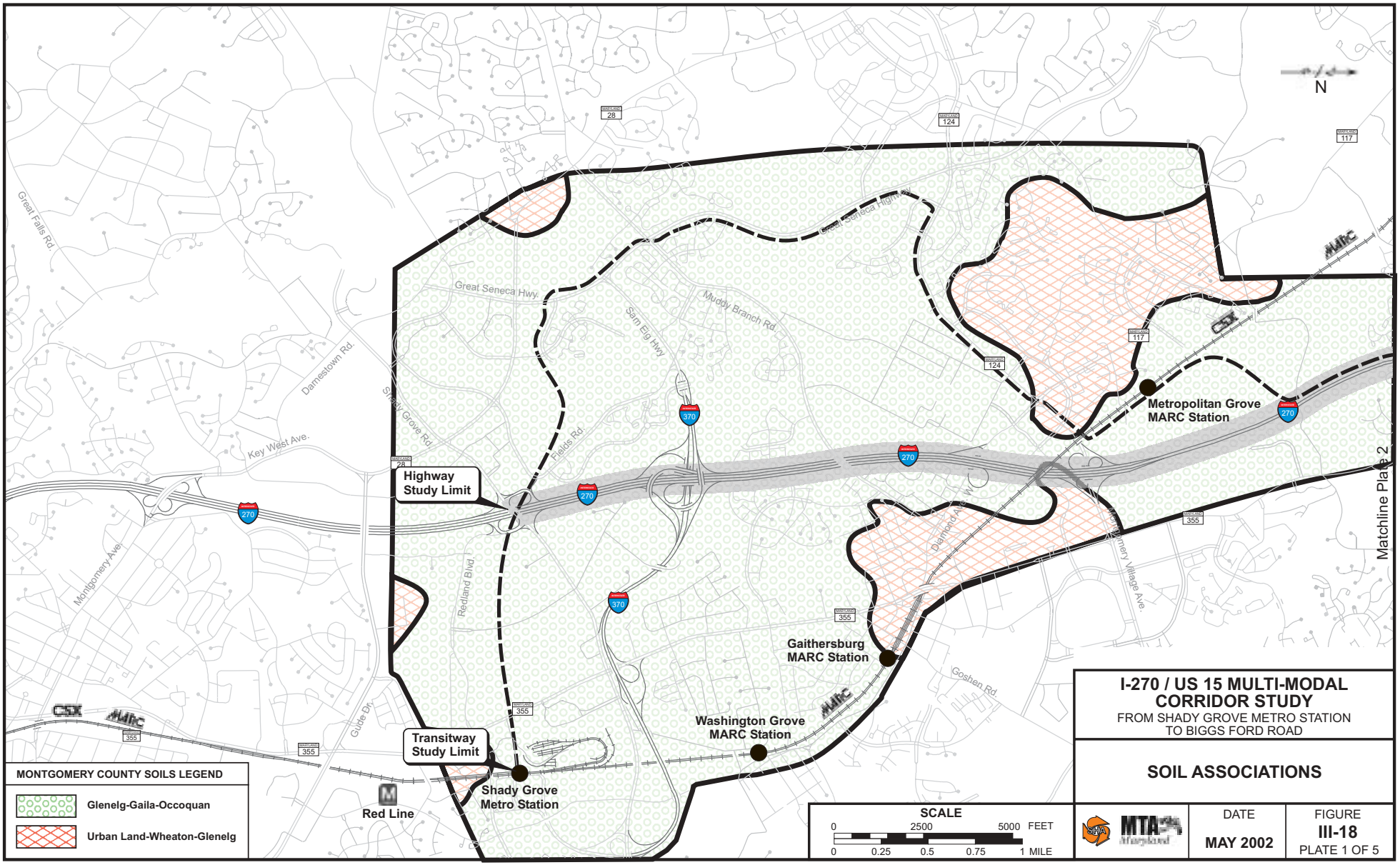
Soils

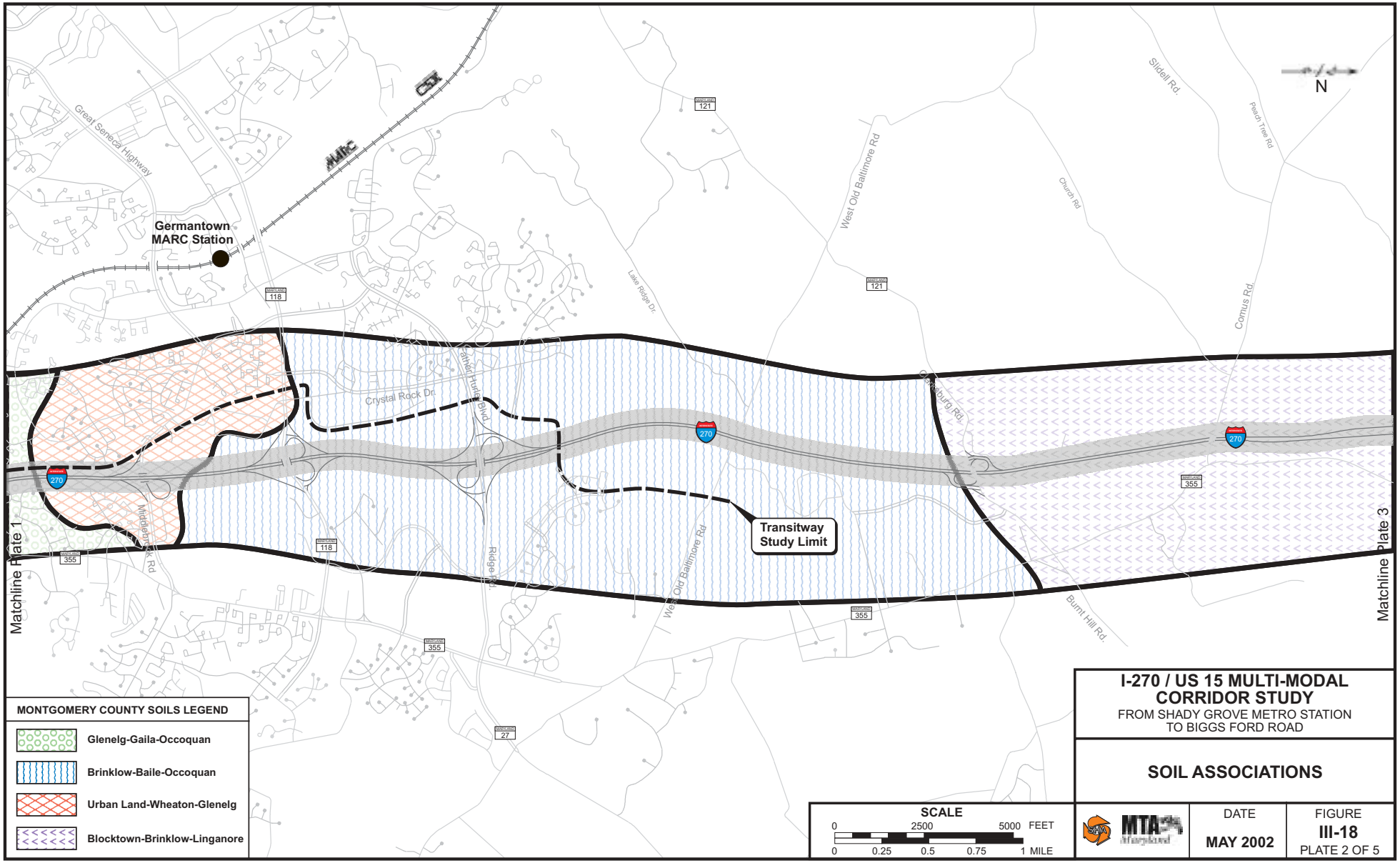
Figure III-18 shows the soil associations that are intercepted by the extensive project area. A soil association is a landscape that has a distinctive proportional pattern of soils and normally consists of one or more major soils and at least one minor soil. The southern section of I-270 that occurs in Montgomery County and extends to Clarksburg is within the Glenelg-Gaila-Occoquan, Brinklow-Baile-Occoquan, and Urban Land-Wheaton-Glenelg associations. These associations are characterized by moderately deep to very deep, well-drained and poorly drained soils formed in material weathered from schist and gneiss. Most of these soils occur on broad ridge tops and side-slopes and are nearly level to strongly sloping. The section of I-270 that starts at Clarksburg and runs through Hyattstown is within the Blocktown-Brinklow-Linganore Association. This association is dominated by shallow and moderately deep, well-drained soils formed in material weathered from phyllite, schist, and gneiss. The soils are loamy throughout and occur on uplands. All soils within this association are poorly suited to most urban uses, due to the depth of bedrock and the slope.

As I-270 continues through Hyattsville into Frederick County it bisects the soils of the Piedmont Plateau. The soil associations of this area include Cardiff, Manor-Linganore-Montalto, Manor-Edgemont-Brandywine, Manor-Linganore-Urbana, and Manor-Glenelg. Most of the soils are well drained, and some are excessively drained. Erosion control is the most serious problem associated with these soils.

The segments of I-270 and US 15 that continue north through the City of Frederick to Biggs Ford Road are of the Duffield-Haggerstown, Sequatchie-Hagerstown, and Athol soil associations. The soils in these associations are mostly well drained, and only a few are at all droughty and have a very low moisture availability. A few small areas are very rocky and contain massive outcrops of hard limestone. The erosion hazard is not severe, because most of the slopes are gentle and runoff is fairly well controlled.

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) has mapped the soil types that occur within these associations for Frederick and Montgomery counties. Seventy-one soil map units occur within the Highway alignment study area representing 37 soil series (**Table III-36**). Twenty-five soil map units occur along the Transitway alignment study area representing 14 soil series (**Table III-37**).


N
Great Falls Rd.
Great Seneca Hwy.
Muddy Branch Rd.
Damestown Rd.
Shady Grove Rd.
Key West Ave.
Sam Eig Hwy
Fields Rd.
Redland Blvd.
Montgomery Ave.
Gude Dr.
Diamond Ave.
Montgomery Village Ave.
Goshen Rd.
Highway Study Limit
Transitway Study Limit
Metropolitan Grove MARC Station
Gaithersburg MARC Station
Washington Grove MARC Station
Shady Grove Metro Station
Red Line
Matchline Plate 2
MONTGOMERY COUNTY SOILS LEGEND
Glenelg-Gaila-Occoquan
Urban Land-Wheaton-Glenelg
SCALE
0 2500 5000 FEET
0 0.25 0.5 0.75 1 MILE
I-270 / US 15 MULTI-MODAL CORRIDOR STUDY
FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD
SOIL ASSOCIATIONS
DATE
MAY 2002
FIGURE
III-18
PLATE 1 OF 5

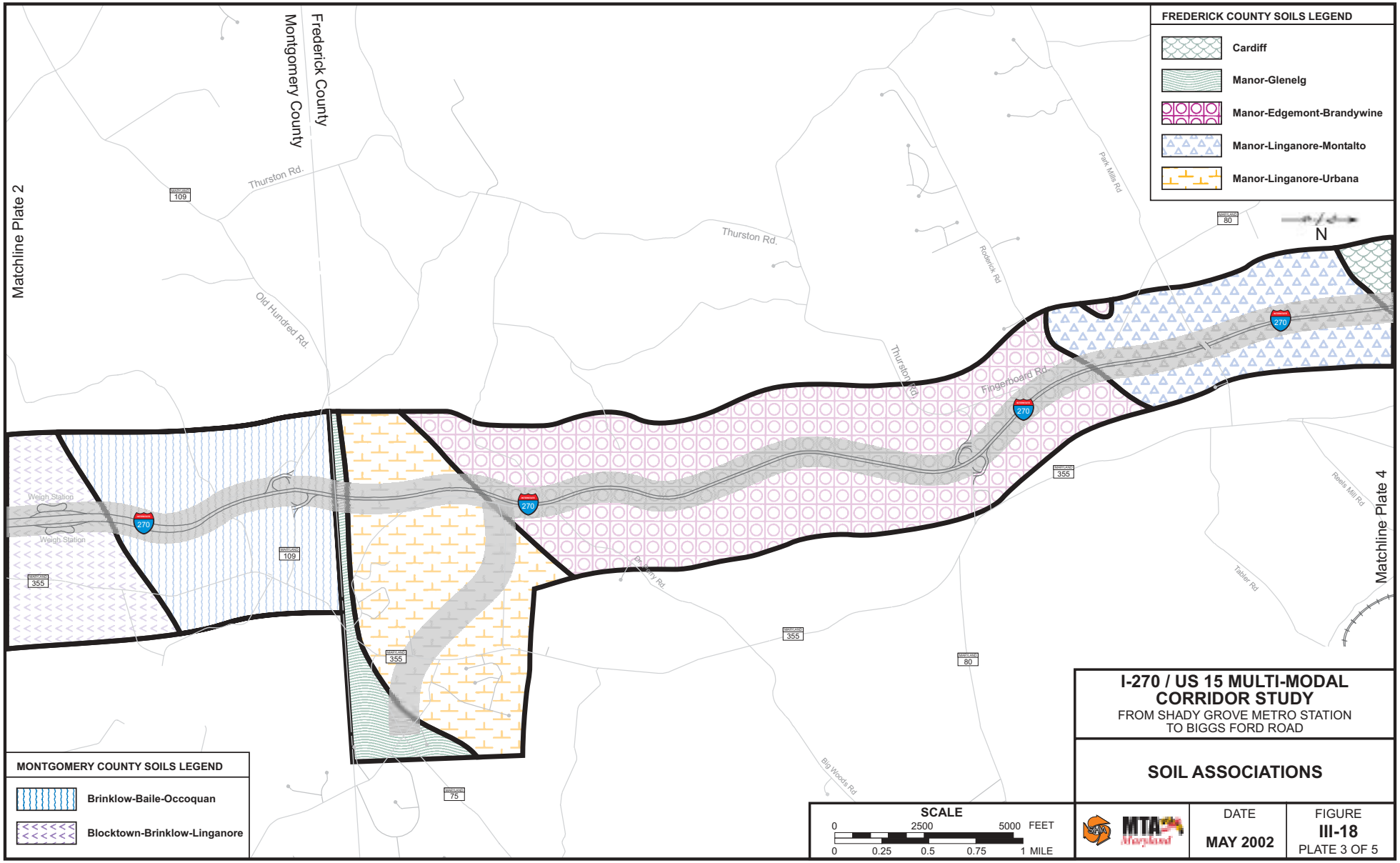


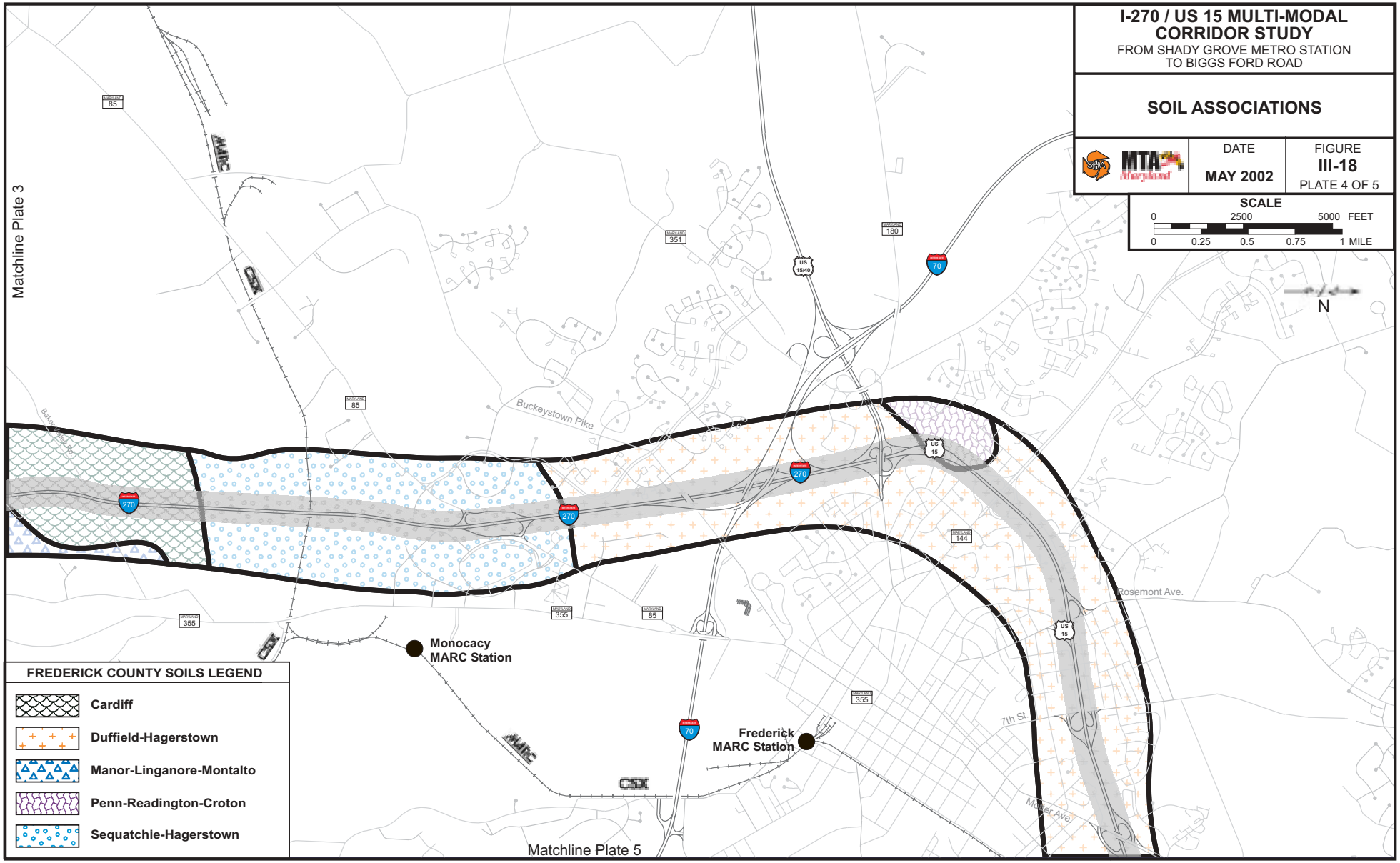
I-270 / US 15 MULTI-MODAL CORRIDOR STUDY

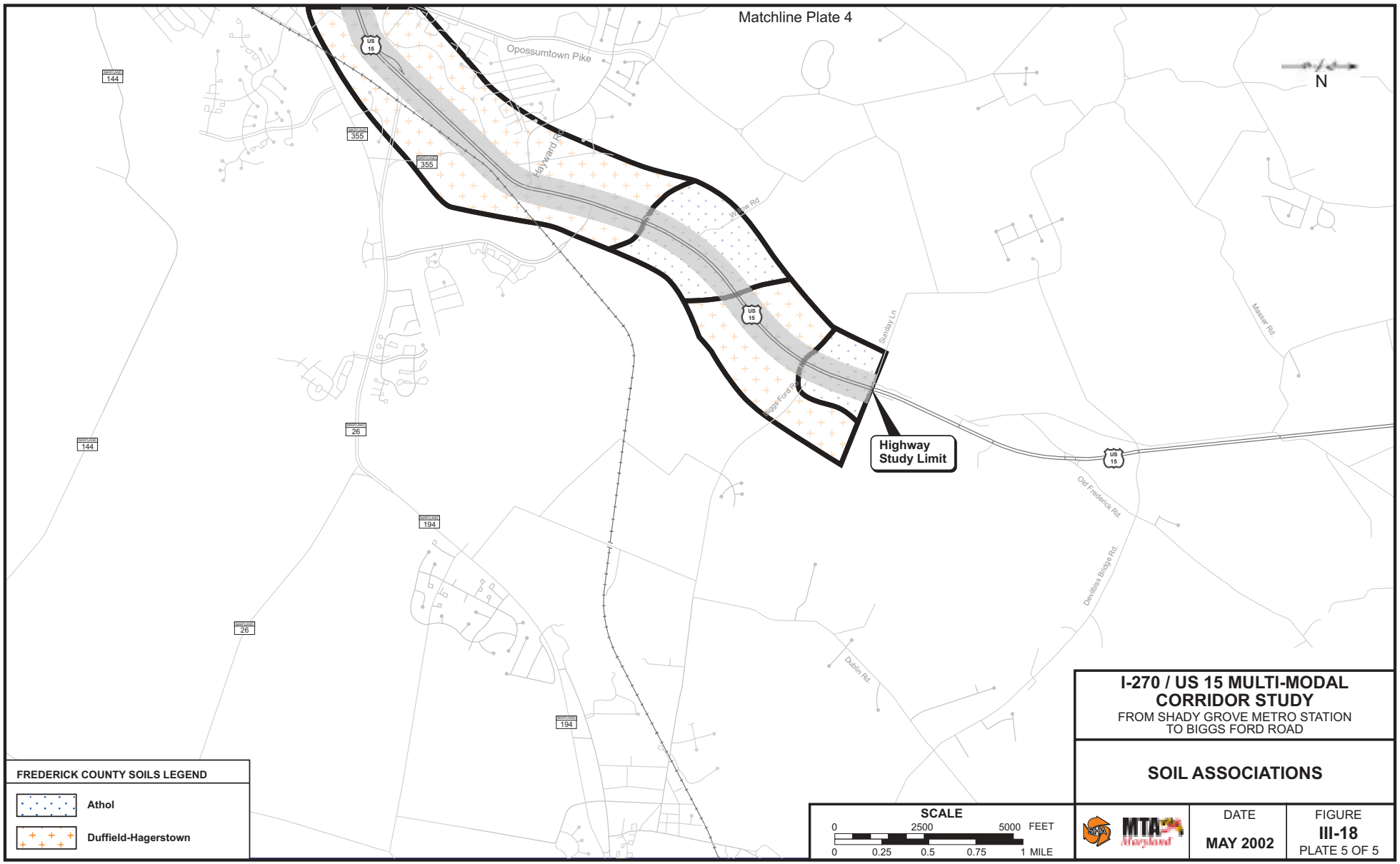
FROM SHADY GROVE METRO STATION
TO BIGGS FORD ROAD

SOIL ASSOCIATIONS

DATE	FIGURE
MAY 2002	III-18
	PLATE 2 OF 5


FREDERICK COUNTY SOILS LEGEND
Cardiff
Manor-Glenelg
Manor-Edgemont-Brandywine
Manor-Linganore-Montalto
Manor-Linganore-Urbana
MONTGOMERY COUNTY SOILS LEGEND
Brinklow-Baile-Occoquan
Blocktown-Brinklow-Linganore
Frederick County
Montgomery County
Matchline Plate 2
Matchline Plate 4
Thurston Rd.
Old Hundred Rd.
Fingerboard Rd.
Park Mills Rd
Roderick Rd
Reels Mill Rd
Tabler Rd
Big Woods Rd
Weigh Station
N
SCALE
0 2500 5000 FEET
0 0.25 0.5 0.75 1 MILE
I-270 / US 15 MULTI-MODAL CORRIDOR STUDY
FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD
SOIL ASSOCIATIONS
DATE
MAY 2002
FIGURE
III-18
PLATE 3 OF 5


I-270 / US 15 MULTI-MODAL CORRIDOR STUDY
FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD
SOIL ASSOCIATIONS
DATE
MAY 2002
FIGURE
III-18
PLATE 4 OF 5
SCALE
0 2500 5000 FEET
0 0.25 0.5 0.75 1 MILE
N
Matchline Plate 3
Matchline Plate 5
Buckeystown Pike
Rosemont Ave.
7th St
Market Ave
Monocacy MARC Station
Frederick MARC Station
FREDERICK COUNTY SOILS LEGEND
Cardiff
Duffield-Hagerstown
Manor-Linganore-Montalto
Penn-Readington-Croton
Sequatchie-Hagerstown



I-270 / US 15 MULTI-MODAL CORRIDOR STUDY

FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD

SOIL ASSOCIATIONS

DATE: MAY 2002

FIGURE III-18

PLATE 5 OF 5

TABLE III-36
SOIL SERIES AND DESCRIPTIONS WITHIN THE HIGHWAY ALIGNMENT

Soil Series	USDA Textures	Drainage Characteristics
Adamstown	Silt loam	Moderately Well Drained
Adamstown-Funkstown	Complex	Moderately Well Drained
Bermudian	Silt loam	Well Drained
Blocktown	Gravelly loam	Well Drained
Brinklow-Blocktown	Channery loams	Well Drained
Buckeystown	Loam, sandy loam	Well Drained
Cardiff	Channery loams	Well Drained
Codorus	Silt loam	Moderately Well Drained
Hatboro	Silt loam	Poorly Drained
Duffield-Ryder	Silt loams, channery silt loams	Well Drained
Edgemont	Rock outcrop complex	Well Drained
Elioak	Silt loam	Well Drained
Gaila	Silt loam	Well Drained
Glenelg-Blocktown	Gravelly loams	Well Drained
Glenelg-Mt. Airy	Channery loams	Well Drained
Glenville	Silt loam	Moderately Well Drained
Baile	Silt loam	Poorly Drained
Hagerstown	Loam, silt loam	Well Drained
Hagerstown-Opequon	Silty clay loam	Well Drained
Hyattstown-Linganore	Channery silt loam	Well Drained
Legore	Gravelly silt loam	Well Drained
Legore-Montalto	Gravelly silt loams	Well Drained
Lindside	Silt loam	Moderately Well Drained
Melvin	Silt loams	Poorly Drained
Mt. Airy	Channery loam	Well Drained
Meyersville	Gravelly silt loam, silt loam	Well Drained
Occoquan	Loam	Well Drained
Reaville	Silt loam	Somewhat Poorly Drained
Rohrersville-Lantz	Silt loams	Somewhat Poorly and Very Poorly Drained
Spoolsville-Catoctin	Complex	Well Drained
Springwood	Gravelly loam	Well Drained
Wheaton-Urban Land	Complex	Well Drained
Whiteford-Cardiff	Channery loams	Well Drained

The properties of soils important for transportation projects include permeability, compactibility, drainage, and shrink-swell potential. For road projects in particular, other considerations such as frost action potential, depth to high water table, depth to bedrock, flooding potential, and slope affect the ease of excavating and grading and the traffic support capacity.

TABLE III-37
SOIL SERIES AND DESCRIPTIONS WITHIN THE TRANSITWAY ALIGNMENT

Soil Series	USDA Textures	Drainage Characteristics
Blocktown	Channery silt loam	Well Drained
Brinklow-Blocktown	Channery silt loam	Well Drained
Occoquan	Loam	Well Drained
Gaila	Silt loam	Well Drained
Neshaminy	Silt loam	Well Drained
Glenelg	Silt loam	Well Drained
Chrome and Conowingo		Well Drained
Chrome	Silt loam	Well Drained
Elioak	Silt loam	Well Drained
Codorus	Silt loam	Moderately Well Drained
Hatboro	Silt loam	Poorly Drained
Glenville	Silt loam	Moderately Well Drained
Wheaton-Urban Land	Complex	Well Drained
Baile	Silt loam	Poorly Drained

The estimated permeability of the soils found along the I-270/US 15 highway and transitway alignments ranges from low to high. The Baile, Reaville, Lantz, and Springwood series contain soils with permeabilities within the upper 24 inches of the soil profile of 0.2 inches per hour or less. The remainder of the soil series has permeabilities that generally range from 0.6 to 2.0 inches per hour. The soils range from poorly drained to well drained, and with the exception of the Brinklow, Duffield, Hagerstown, Opequon, Linganore, Lantz, Rohrersville, Legore, Montalto, Chrome, and Conowingo series, have little potential for shrink-swell. Soils that are severely affected by frost action include Codorus, Hatboro, Glenville, Lantz, Rohrersville, Lindside, Melvin, Reaville, and Baile. Soils with a seasonally high water table to within a half-foot of the ground surface include Baile, Lantz, Melvin, and Hatboro.

Soils encountered along the highway and transitway alignments have been evaluated for roadway constructability. All soils along the alignment have some limitations for use as a roadway. Limitations include slope, large stones, frost action, wetness, flooding, low strength, depth to rock, and shrink-swell. Those soil series with the most severe restrictions include Glenville, Bermudian, Brinklow, Cardiff, Edgemont, Hatboro, Blocktown, Baile, Codorus, Hyattstown, Linganore, Lindside, Melvin, Reaville, Rohrersville, Lantz, and Elioak.

Soils are also rated for their use as a source of roadfill for embankments generally less than six feet high. Soils rated good contain significant amounts of sand or gravel or both, have at least a five-foot depth of suitable material, low shrink-swell potential, few cobbles and stones, slopes of 15% or less, and a depth to the water table of more than three feet. Soils rated fair are comprised of more than 35% silt and clay particles, have a plasticity index of less than 10, have a moderate shrink-swell potential, slopes of 15% to 25%, many stones, and a depth to the water table of between one and three feet. Along the I-270/US 15 Corridor highway and transitway alignments, soils with good or fair ratings include Buckeystown, Cardiff, Edgemont, Hyattstown, Mt. Airy, Myersville, Springwood, Glenelg, Wheaton-Urban Land, Urban Land, and Whiteford.

b. Impacts

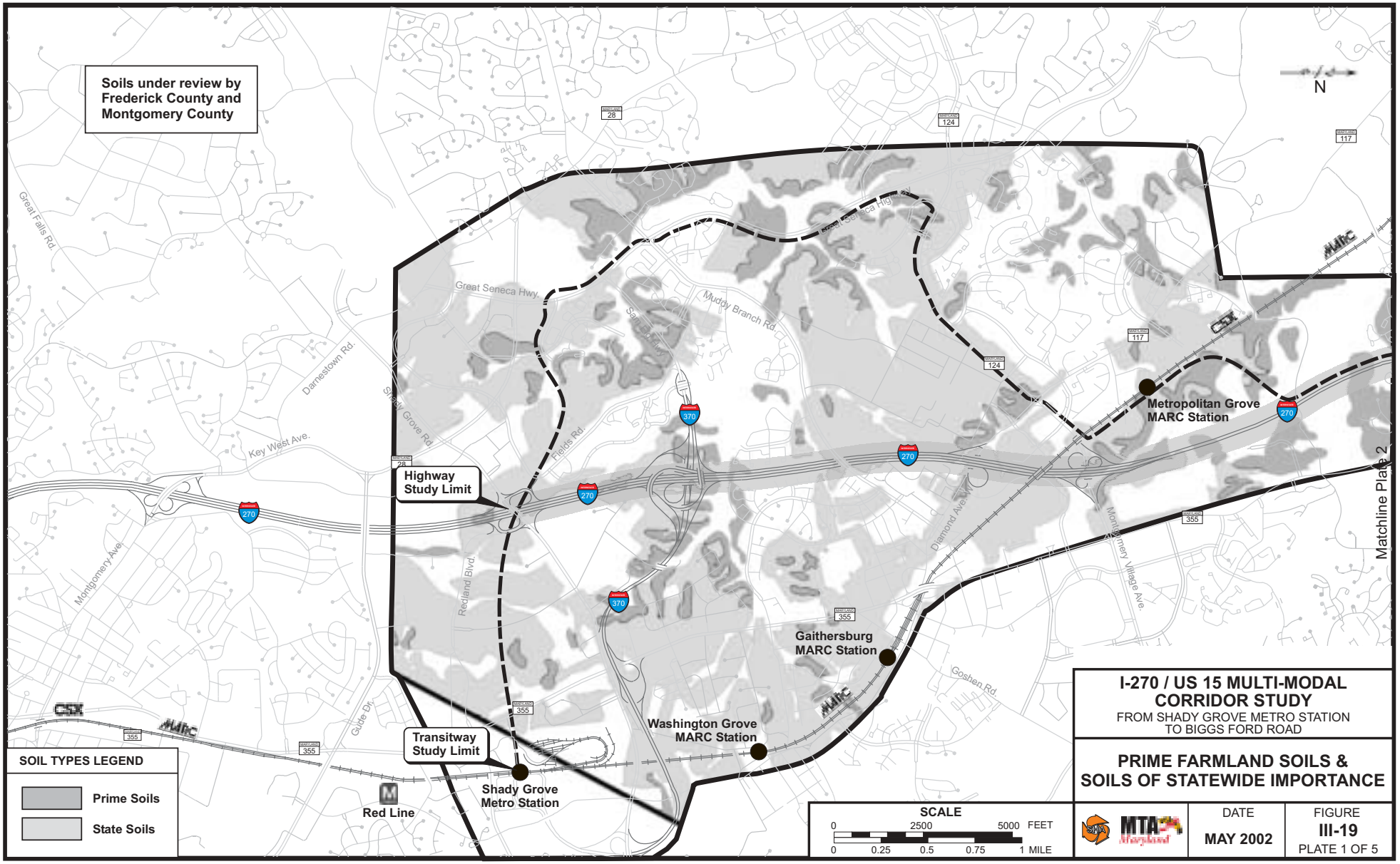
The No-Build, TSM/TDM or build alternates will not affect the overall topography and underlying geology of the I-270/US 15 Corridor. However, in various areas where grading is proposed along the highway and transitway alignments, substantial cuts or fills will be necessary. A more detailed assessment of these impacts will be addressed during later phases of the project. Soil disturbances will not occur as a result of the No-Build Alternate. However, soil disturbances will occur where land grading is necessary to construct roads, park and ride lots, transitway, transitway yard/shop sites, and transitway stations associated with the TSM/TDM and build alternates. Because much of the planned highway and transitway improvements are in areas that have already been disturbed, the impact to adjacent undisturbed soils will in most cases be minor.

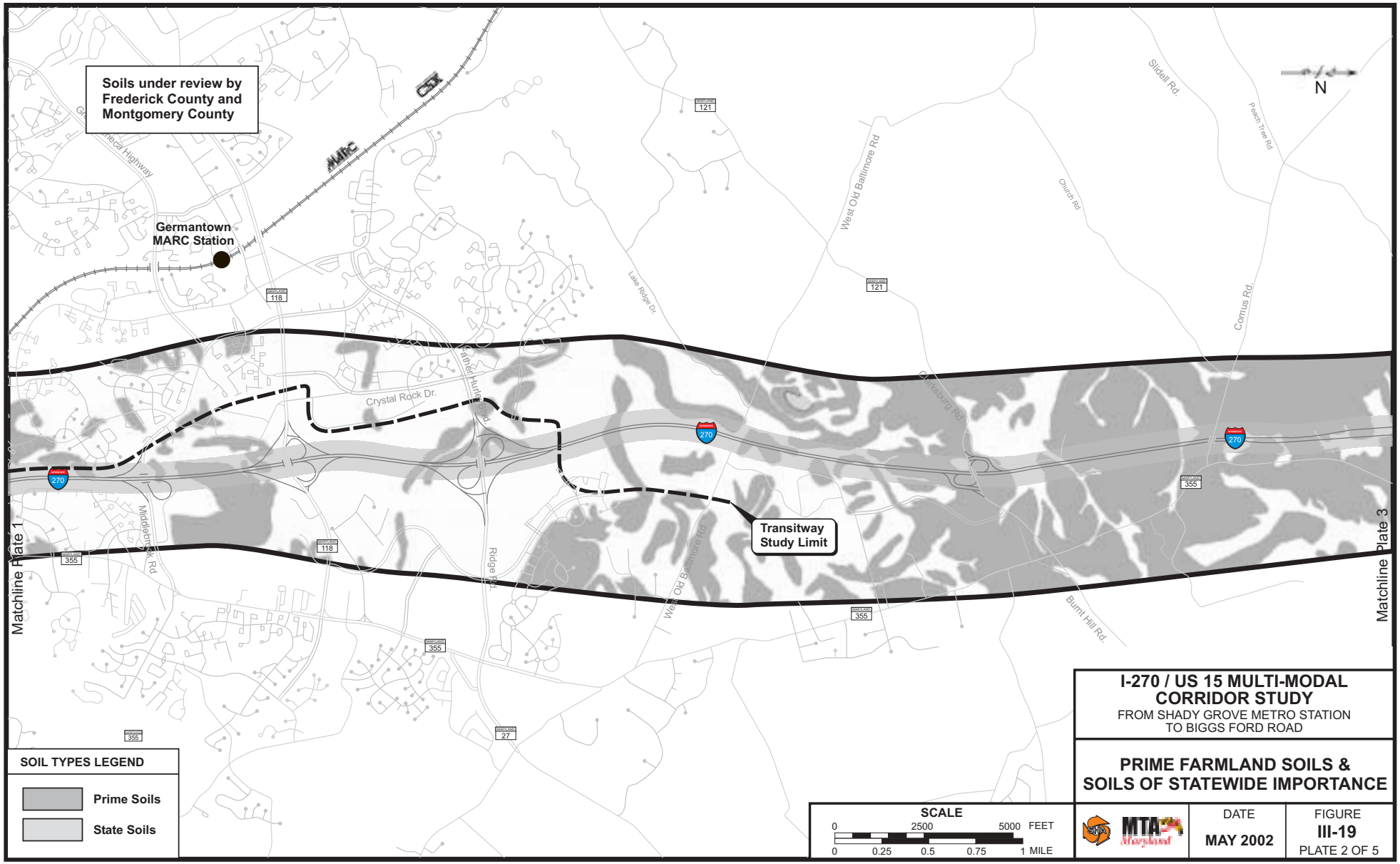
Within the Montgomery County portion of the project area Glenelg, Blocktown, Gaila, Brinklow-Blocktown, Occoquan, Hyattstown, and Linganore-Hyattstown soil types are classified as highly erodible soils. These highly erodible soils comprise over half of the project area in Montgomery County, primarily in the northern portion. Within the Frederick County portion of the project area Cardiff, Codorus-Hatboro, Duffield-Ryder, Duffield-Hagerstown, Glenville, Glenville-Baile, Glenville-Codorus, Hagerstown, Hatboro-Codorus, Legore, Legore-Montalto, Lindside, Melvin-Lindside, Mt. Airy, Myersville, Reaville, Rohrersville-Lantz, Spoolsville-Catoctin, Springwood, and Whiteford-Cardiff soil types are classified as highly erodible soils. Highly erodible soils comprise over three quarters of the project area in Frederick County. To avoid the loss of soil from areas under construction, erosion control techniques such as infiltration, sediment basins and traps, and silt fencing will be used. All areas of exposed soil will be vegetatively or structurally stabilized as soon as practicable.

2. Prime Farmlands and Significant Soils

a. Existing Conditions

The Maryland NRCS office was contacted to obtain information regarding prime farmland soils and farmland soils of statewide importance in Frederick and Montgomery counties. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. The land does not have to be currently used as cropland, but can be pastureland, forestland, or other land that is not open water or built-up land. Prime farmland soils typically have an adequate and dependable water supply, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt content, and few or no rocks. They are permeable to water and air, not excessively erodible or saturated with water for a long period of time, and do not flood frequently or are protected from flooding. The prime farmland soils and farmland soils of statewide importance that occur within the I-270/US 15 Corridor are mapped in **Figure III-19** and described in **Table III-38** and **Table III-39**, respectively.


Soils under review by Frederick County and Montgomery County
N
Great Falls Rd.
Darnestown Rd.
Key West Ave.
Montgomery Ave.
Great Seneca Hwy.
Muddy Branch Rd.
Shady Grove Rd.
Fields Rd.
Redland Blvd.
Diamond Ave.
Montgomery Village Ave.
Goshen Rd.
Glade Dr.
Highway Study Limit
Transitway Study Limit
Metropolitan Grove MARC Station
Gaithersburg MARC Station
Washington Grove MARC Station
Shady Grove Metro Station
Red Line
Matchline Plate 2
SOIL TYPES LEGEND
Prime Soils
State Soils
SCALE
0 2500 5000 FEET
0 0.25 0.5 0.75 1 MILE
I-270 / US 15 MULTI-MODAL CORRIDOR STUDY
FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD
PRIME FARMLAND SOILS & SOILS OF STATEWIDE IMPORTANCE
MTA Maryland
DATE
MAY 2002
FIGURE
III-19
PLATE 1 OF 5



I-270 / US 15 MULTI-MODAL CORRIDOR STUDY

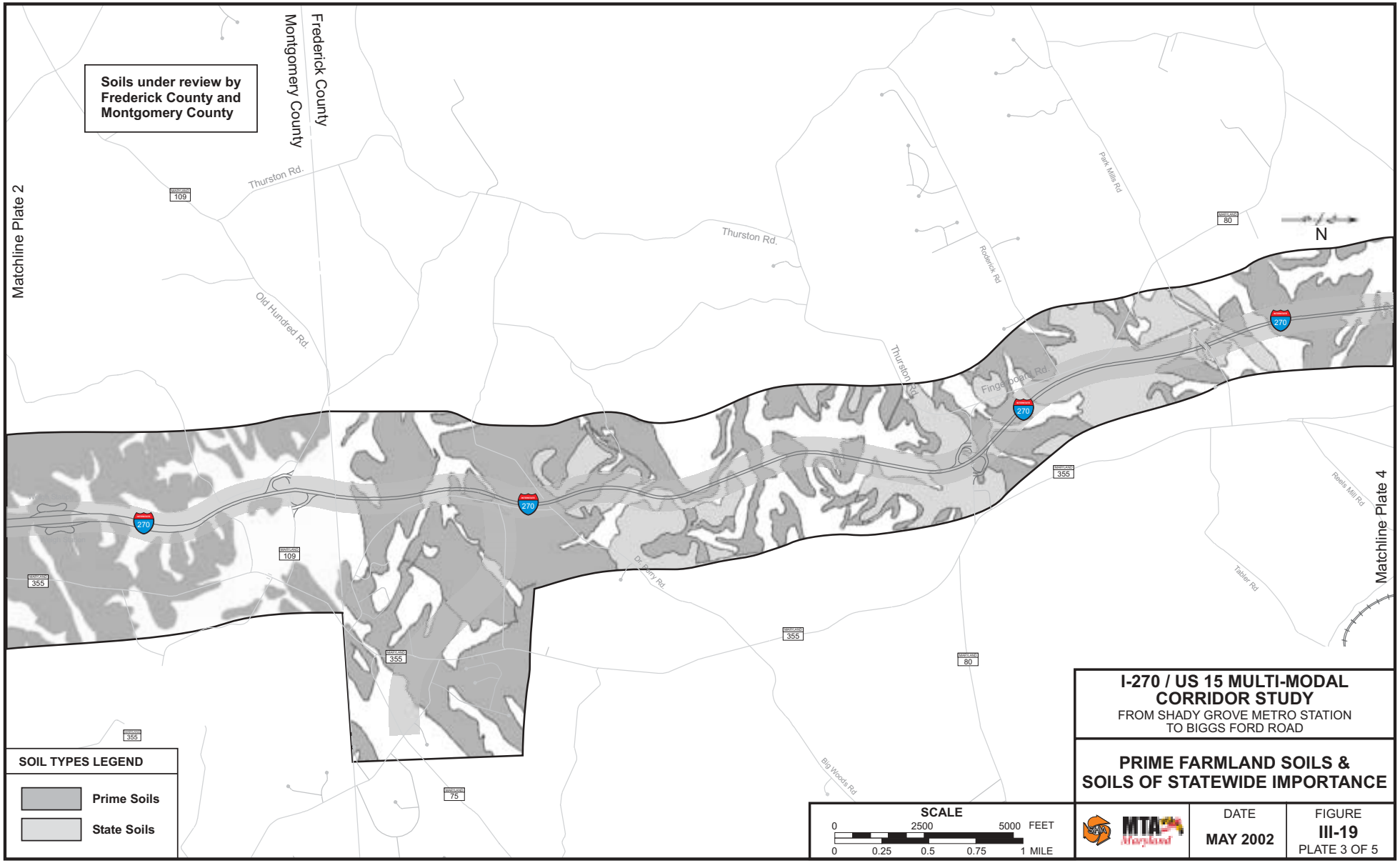
FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD

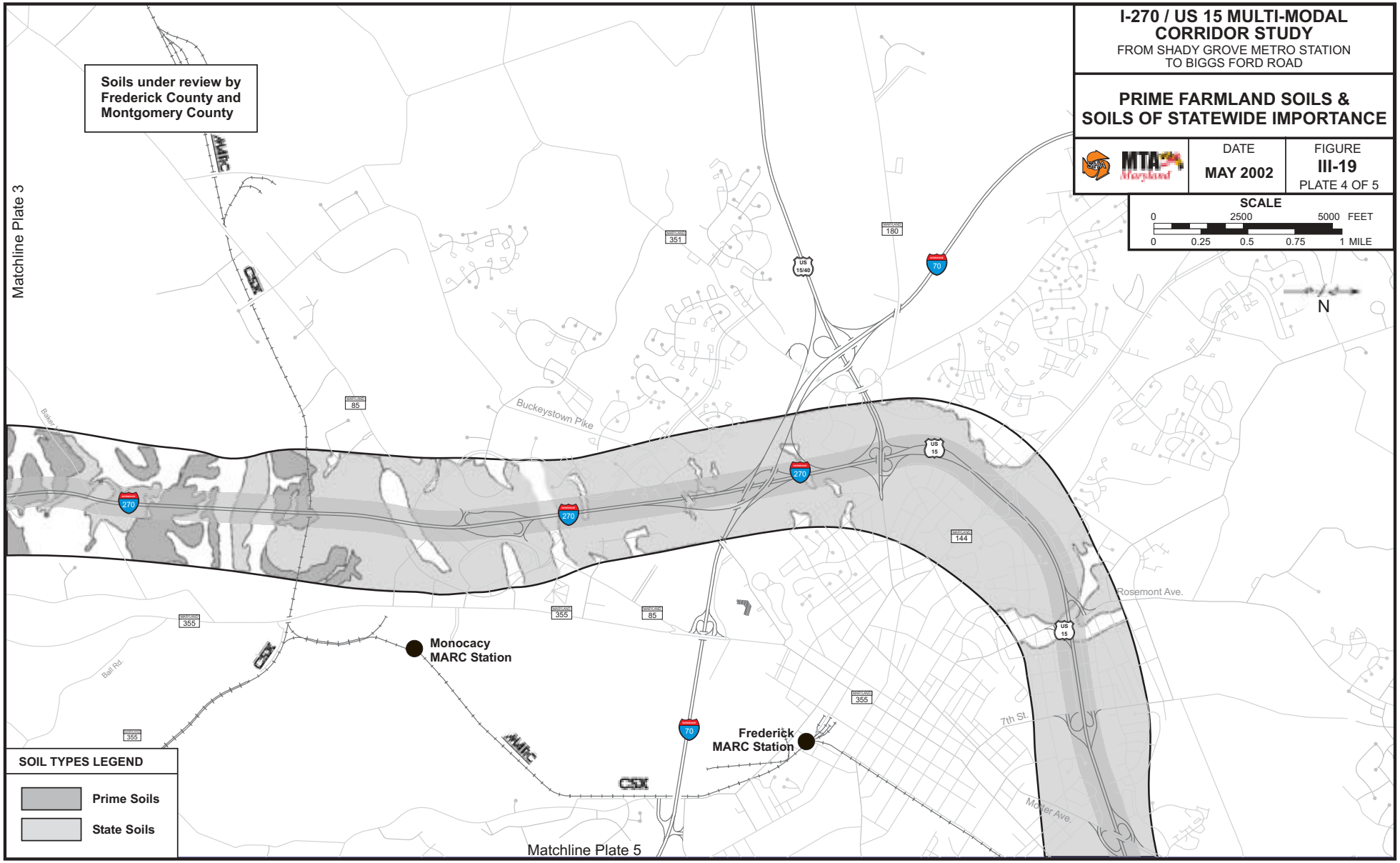
PRIME FARMLAND SOILS & SOILS OF STATEWIDE IMPORTANCE

DATE: MAY 2002

FIGURE III-19

PLATE 2 OF 5


Soils under review by Frederick County and Montgomery County
Frederick County
Montgomery County
Matchline Plate 2
Matchline Plate 4
Thurston Rd.
Old Hundred Rd.
Park Mills Rd
Roderick Rd
Fingerboard Rd.
Reels Mill Rd
Tabler Rd
Dr. Perry Rd
Big Woods Rd
N
SOIL TYPES LEGEND
Prime Soils
State Soils
SCALE
0 2500 5000 FEET
0 0.25 0.5 0.75 1 MILE
I-270 / US 15 MULTI-MODAL CORRIDOR STUDY
FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD
PRIME FARMLAND SOILS & SOILS OF STATEWIDE IMPORTANCE
DATE
MAY 2002
FIGURE
III-19
PLATE 3 OF 5


I-270 / US 15 MULTI-MODAL CORRIDOR STUDY
FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD
PRIME FARMLAND SOILS & SOILS OF STATEWIDE IMPORTANCE
DATE
MAY 2002
FIGURE
III-19
PLATE 4 OF 5
SCALE
0 2500 5000 FEET
0 0.25 0.5 0.75 1 MILE
N
Soils under review by Frederick County and Montgomery County
Matchline Plate 3
Matchline Plate 5
Buckeystown Pike
Monocacy MARC Station
Frederick MARC Station
Rosemont Ave.
7th St.
Motter Ave.
Bell Rd.
SOIL TYPES LEGEND
Prime Soils
State Soils

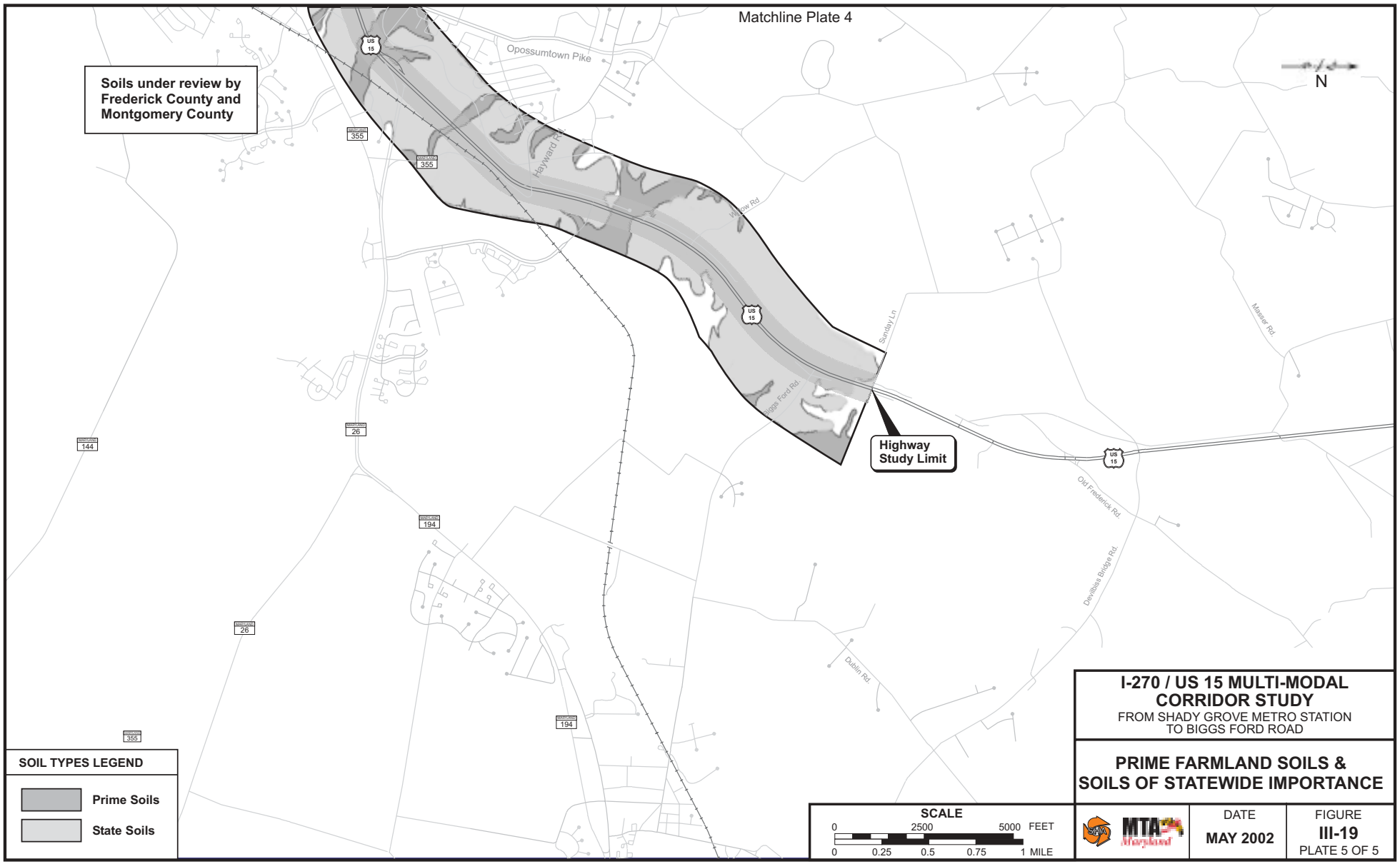

Matchline Plate 4
Soils under review by Frederick County and Montgomery County
N
Opossumtown Pike
Hayward Rd
Willow Rd
Sunday Ln
Masser Rd
Biggs Ford Rd.
Highway Study Limit
Old Frederick Rd.
Devilbiss Bridge Rd.
Dublin Rd.
US 15
MARYLAND 355
MARYLAND 26
MARYLAND 144
MARYLAND 194
SOIL TYPES LEGEND
Prime Soils
State Soils
SCALE
0 2500 5000 FEET
0 0.25 0.5 0.75 1 MILE
I-270 / US 15 MULTI-MODAL CORRIDOR STUDY
FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD
PRIME FARMLAND SOILS & SOILS OF STATEWIDE IMPORTANCE
DATE
MAY 2002
FIGURE
III-19
PLATE 5 OF 5

TABLE III-38
PRIME FARMLAND SOILS WITHIN THE I-270/US 15 CORRIDOR

Map Unit	Soil Series
AdB	Adamstown silt loam, 3 to 8 percent slopes
AfB	Adamstown-Funkstown complex, 0 to 8 percent slopes
BfA	Bermudian silt loam, 0 to 3 percent slopes
BtB	Buckeystown loam, 3 to 8 percent slopes
DtA	Duffield-Ryder silt loams, 0 to 3 percent slopes
DtB	Duffield-Ryder silt loams, 3 to 8 percent slopes
DuB	Duffield and Ryder channery silt loams, 3 to 8 percent slopes
GmB	Glenelg-Mt. Airy channery loams, 3 to 8 percent slopes
GoB	Glenville silt loam, 3 to 8 percent slopes
GvB	Glenville-Codorus complex, 3 to 8 percent slopes
HaB	Hagerstown loam, 3 to 8 percent slopes
HbB	Hagerstown silt loam, 3 to 8 percent slopes
LgB	Legore gravelly silt loam, 3 to 8 percent slopes
LsA	Lindside silt loam, 0 to 3 percent slopes
MuB	Myersville gravelly silt loam, 3 to 8 percent slopes
MvA	Myersville silt loam, 0 to 3 percent slopes
MvB	Myersville silt loam, 3 to 8 percent slopes
SpA	Springwood gravelly loam, 0 to 3 percent slopes
SpB	Springwood gravelly loam, 3 to 8 percent slopes
17B	Occoquan loam, 3-8% slopes
4B	Elioak silt loam, 3 to 8 percent slopes
2A	Glenelg silt loam, 0 to 3 percent slopes
2B	Glenelg silt loam, 3 to 8 percent slopes
27B	Neshaminy silt loam, 3 to 8 percent slopes
1B	Gaila silt loam, 3 to 8 percent slopes

The Farmland Protection Policy Act (FPPA), as amended in 1984 and 1994, includes criteria defining the situations to which the FPPA applies and to which a Form AD-1006 is required. Under this legislation, federal programs are administered in compatibility with state and local government, and private programs and policies to protect farmland. In Frederick and Montgomery counties the FPPA applies to prime farmland soils and soils of statewide importance. The criteria for these designations are related to soil characteristics such as texture, depth to water table, slope, and available moisture. These soils have the best combination of soil quality, growing season, and water supply for growing food and are capable of economically sustaining high crop yields. Urban areas and areas planned for development overlying prime farmland soils and soils of statewide importance are excluded from consideration under the FPPA. While many areas, particularly in Montgomery County, qualify for exclusion because of planned and ongoing development, there are still areas in the northern portion of the county that remain in active farmland and have prime farmland soils or soils of statewide importance. Actively farmed areas also occur in Frederick County north and south of the City of Frederick.

TABLE III-39
SOILS OF STATEWIDE IMPORTANCE WITHIN THE I-270/US 15 CORRIDOR

Map Unit	Soil Series
16B	Brinklow-Blocktown channery silt loam, 3-8% slopes
16C	Brinklow-Blocktown channery silt loam, 8-15% slopes
1C	Gaila silt loam, 8-15% slopes
2C	Glenelg silt loam, 8-15% slopes
9B	Linganore-Hyattstown channery silt loam, 3-8% slopes
9C	Linganore-Hyattstown channery silt loam, 8-15% slopes
17B	Occoquan loam, 3-8% slopes
17C	Occoquan loam, 8-15% slopes

Note: *Table III-39 lists Soils of Statewide Importance in Montgomery County (within the I-270/US 15 Corridor).*

b. Impacts

The No-Build Alternate will not impact prime farmland soils or soils of statewide importance. These soils will be impacted by the TSM/TDM alternate and build alternates of this project. However, based on the alignments of the proposed highway and transitway alternates and other facilities being considered, impacts to farmlands are primarily encroachment rather than a total disturbance to farming operations. Also, according to master plan documents for Montgomery and Frederick counties, many areas that are presently in agricultural use are planned for development. Some of these farm areas are already being converted to commercial, residential, and institutional developments. **Table III-40** summarizes impacts to soils by alternate on agriculturally zoned, actively farmed properties.

In accordance with the Farmland Protection Policy Act (FPPA), coordination is being completed with the NRCS offices of Frederick and Montgomery Counties. The forms are included in **Appendix F** of this document.

TABLE III-40
COMPARISON OF FARMLAND SOILS IMPACTS FOR THE I-270/US 15 CORRIDOR

Farmland Soils	Farmland Soils Impacts (Acres) by Alternate					
	Alternate 1	Alternate 2	Alternates 3A/B	Alternates 4A/B	Alternates 5A/B	Alternate 5C
Prime Farmland Soils	--	14.4	284.6[1]	284.6[1]	291.2[1]	207.7[2]
Soils of Statewide Importance[3]	-	17.3[3]	367.0[3]	367.0[3]	391.9[3]	339.6[3]

1 Includes 88.8 acres of impact for the Transitway Alignment and 14.4 acres of impact for the Park and Ride lots.
2 Includes 14.4 acres of impact for the Park and Ride lots.
3 Includes all soils impacted in Frederick County (including Prime Farmland Soils, Soils of Statewide Importance, and all other soils) and Soils of Statewide Importance impacted in Montgomery County. Coordination is being completed with the NRCS offices of Frederick and Montgomery Counties.

F. SURFACE WATER

1. Waters of the US including Wetlands

a. Existing Conditions

Jurisdictional Wetlands

All Waters of the US, including wetlands, are regulated in accordance with Section 401 and 404 of the Clean Water Act and under the State of Maryland Nontidal Wetlands Protection Act. The US Army Corps of Engineers (USACOE) and the Maryland Department of the Environment (MDE) administer this act for all Waters of the US including wetlands that will potentially be impacted by the project. Impacts to these resources require a Section 401 Water Quality Certificate from the MDE and a Section 404 permit from the USACOE for the discharge of dredged and fill material into Waters of the US, including wetlands.

A detailed wetland survey was conducted within the Corridor to identify wetlands and Waters of the US that could potentially be affected by the proposed project. Existing information from the US Fish and Wildlife Service (USFWS), National Wetland Inventory (NWI) maps, United States Geological Survey (USGS) topographic maps, and NRCS for Montgomery and Frederick counties were reviewed to locate potential wetland areas prior to the field delineation. The field investigation for the I-270/US 15 Corridor highway alignment was conducted from March to September of 1998 to identify and delineate the boundaries of wetlands, while the field investigation for the transitway alignment was conducted in February 1998.

The 1987 USACOE Wetland Delineation Manual was used to determine whether each area met the federal criteria for wetland designation. This manual employs a three-parameter approach to identifying wetlands including the presence of hydrophytic vegetation, hydric soils, and an appropriate hydroperiod. All three parameters must be present for an area to be considered a wetland under Section 404 of the Clean Water Act. Areas that do not meet the three parameters that still may be regulated include open-water, riverine systems (Waters of the US), and certain disturbed areas. Waters of the US are areas that function hydrologically as a conveyance for water but do not exhibit all of the necessary parameters to meet the wetland definition. These areas are typically streams, unvegetated swales or low areas that have an adequate hydroperiod or exhibit hydrologic indicators, but have little or no wetland vegetation or may lack hydric soil indicators. However, as Waters of the US, they are protected under Section 404 and are regulated by the USACOE.

In the fall 1998, the USACOE, MDE and the USFWS participated in Jurisdictional Determination (JD) field reviews to concur with the I-270/US 15 Corridor wetland delineations. The transitway alignment JD occurred in the summer of the following year.

Plans for other facilities, including park and ride lots, transit stations, and yard/shop facility locations, were not developed until Spring 2001. Wetlands and waterways potentially occurring within these proposed facilities were assessed using Maryland Department of Natural Resources (DNR) Nontidal Wetland Guidance Maps. The maps were reviewed for the potential presence of wetlands or waterways at each proposed site and the DNR mapped boundaries transferred onto

project mapping. A field reconnaissance was then conducted for each proposed site to verify the DNR mapping, to fine-tune the wetland boundaries on project mapping, and to record dominant wetland vegetation and hydrologic indicators.

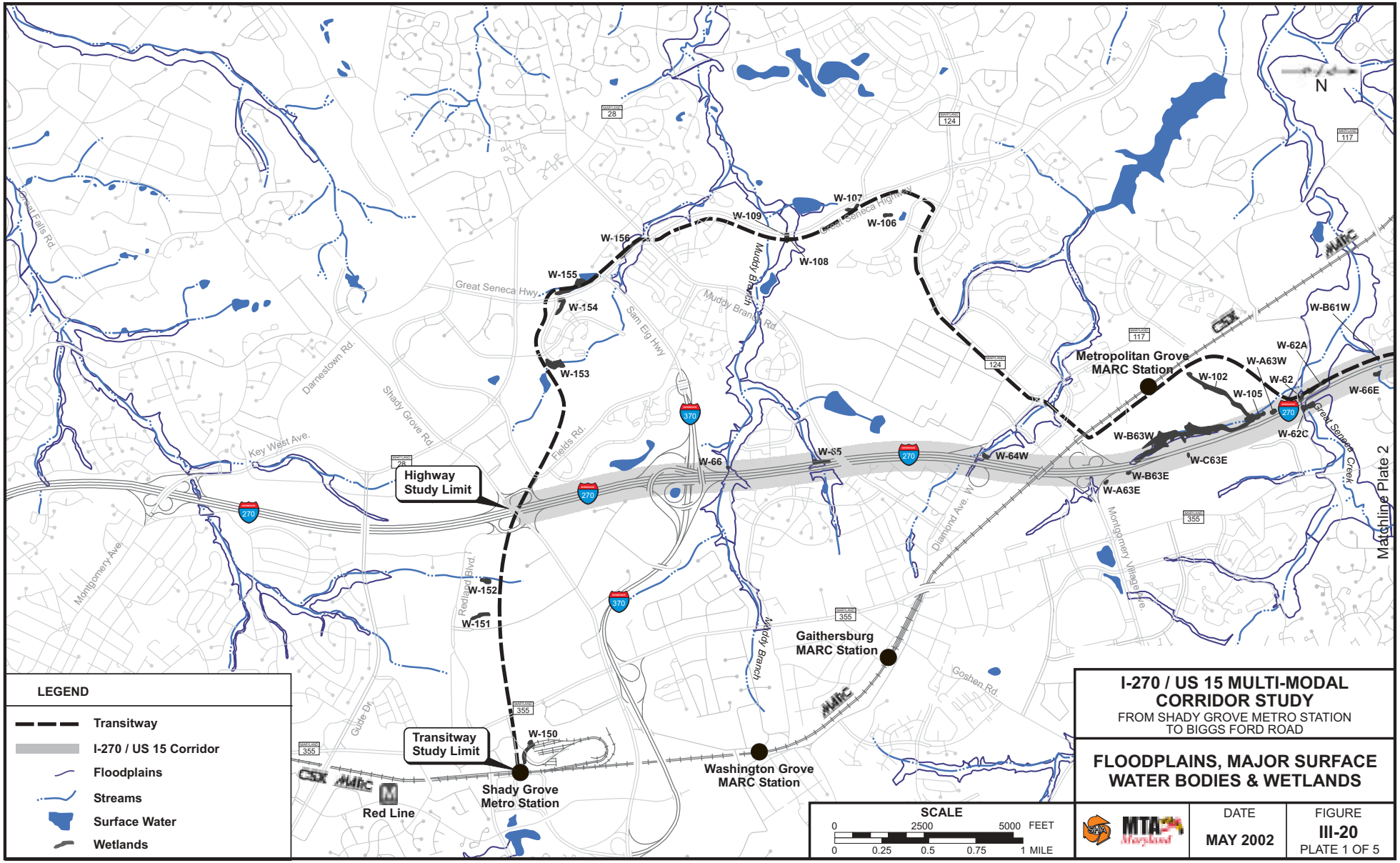
Wetland functions were performed for all wetlands using the Evaluation for Planned Wetlands (EPW) method. This method is a rapid-assessment procedure for use in determining whether a planned wetland has been adequately designed to achieve wetland functional goals. EPW provides a technique for comparing functional capacity of a wetland assessment area and a planned wetland. Functional capacity is the magnitude or degree to which a wetland performs a function. In order to determine this capacity, the functional capacity index (FCI) is used as a dimensionless number from 0.0 to 1.0 that describes a wetland's relative capacity to perform a function, where 0.0 represents no functional capacity and 1.0 represents optimal functional capacity. The EPW method evaluates five major wetland functions that include:

- **Sediment Stabilization (SS)** -- capacity to stabilize and retain previously deposited sediments.
- **Water Quality (WQ)** -- capacity to retain and process dissolved or particulate material to the benefit of downstream surface water quality.
- **Wildlife (WL)** -- degree to which a wetland functions as habitat for wildlife as described by habitat complexity.
- **Fish in Non-Tidal Stream/River (FS)** -- degree to which a wetland habitat meets the food/cover, reproductive, and water quality requirements of fish.
- **Uniqueness/Heritage (UH)** -- presence of characteristics that distinguish a wetland as unique, rare, or valuable**.**

One hundred nineteen (119) numbered wetland areas were flagged within the I-270/US 15 Corridor, including 102 along the highway alignment and 17 along the transitway alignment. **Figure III-20** shows the locations of the wetlands along the highway and transitway alignments. The wetland areas within the I-270/US 15 Corridor fall into four categories including:

- perennial streams and their intermittent tributaries;
- wetland floodplains (palustrine forested, scrub-shrub and emergent) associated with perennial and intermittent streams;
- headwater seep wetlands; and
- wetlands situated within roadside drainage ways.

Details regarding the perennial and intermittent streams throughout the I-270/US 15 Corridor highway and transitway alignments are discussed under the Streams and Water Resources section under Surface Waters.

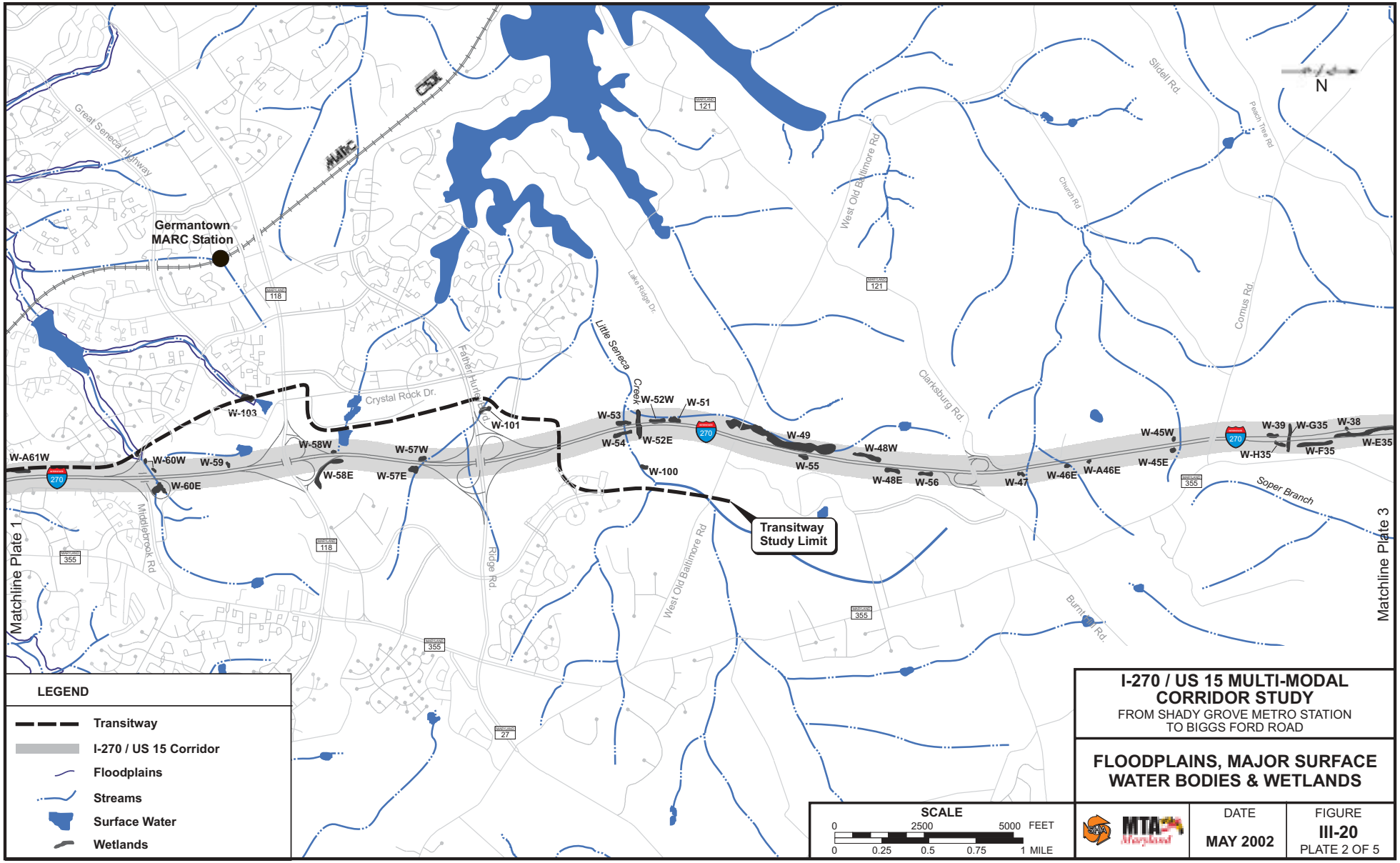


I-270 / US 15 MULTI-MODAL CORRIDOR STUDY

FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD

FLOODPLAINS, MAJOR SURFACE WATER BODIES & WETLANDS

DATE	FIGURE
MAY 2002	III-20
	PLATE 1 OF 5

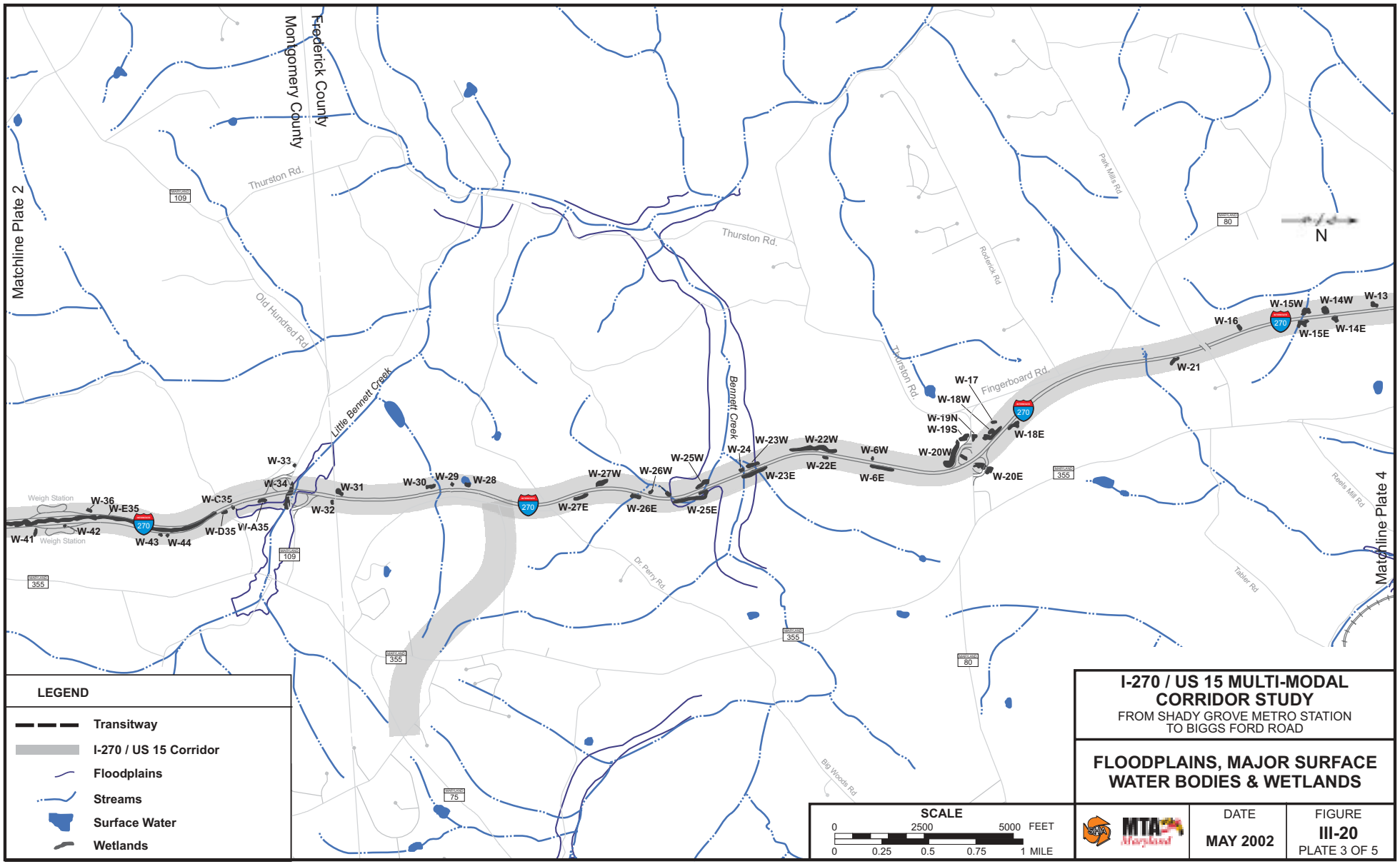


I-270 / US 15 MULTI-MODAL CORRIDOR STUDY

FROM SHADY GROVE METRO STATION
TO BIGGS FORD ROAD

FLOODPLAINS, MAJOR SURFACE WATER BODIES & WETLANDS

DATE	FIGURE
MAY 2002	III-20
	PLATE 2 OF 5



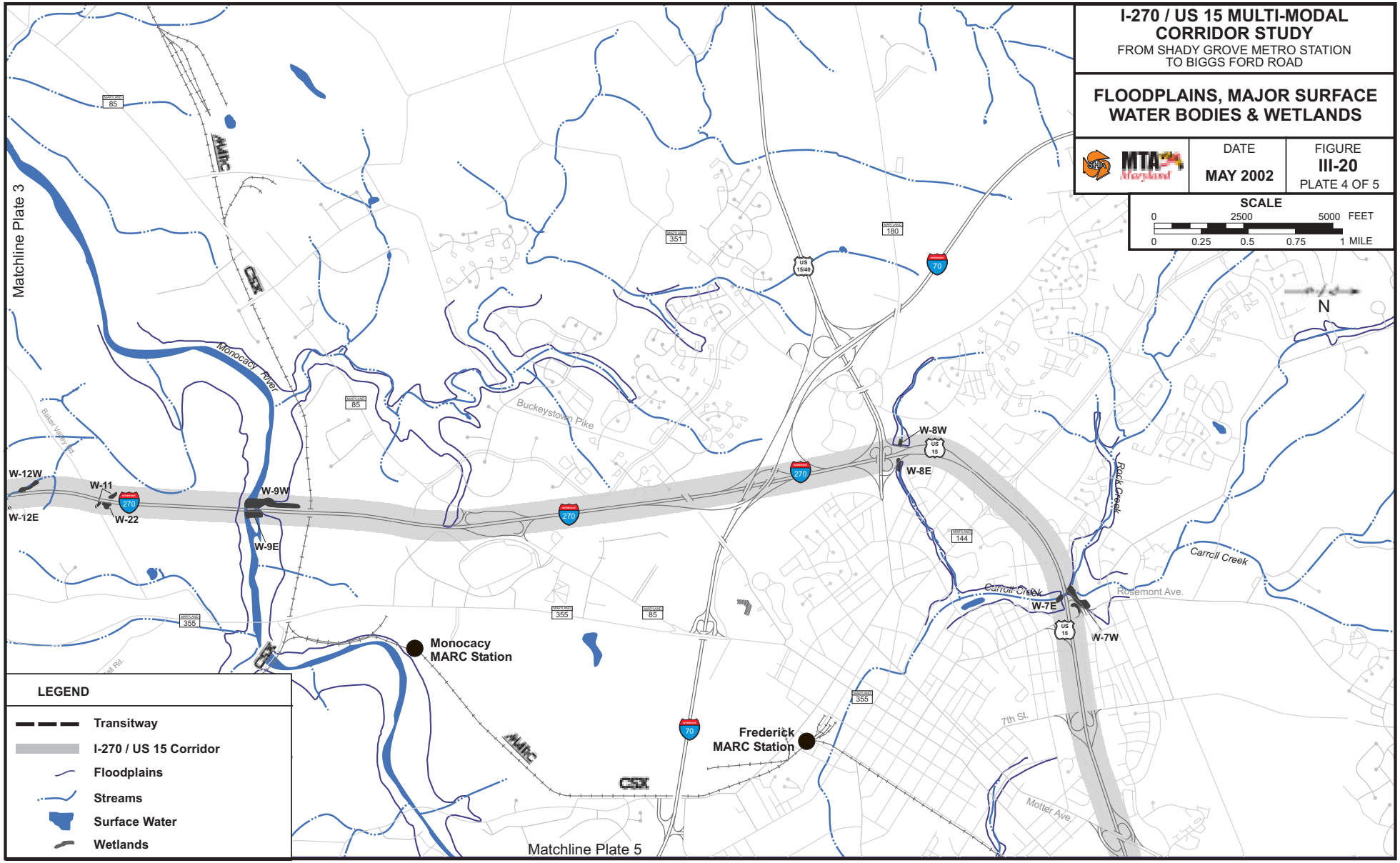
I-270 / US 15 MULTI-MODAL CORRIDOR STUDY

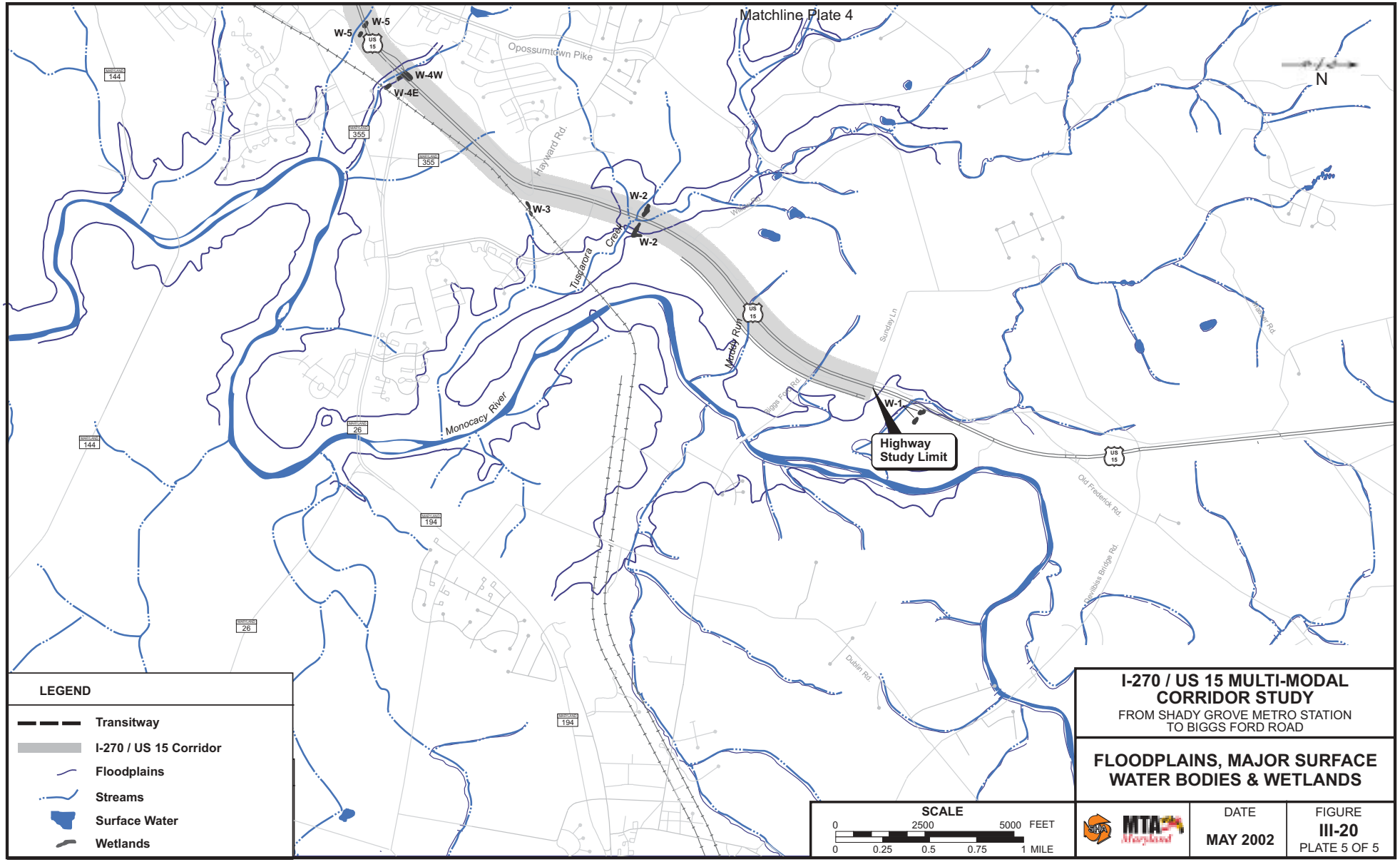
FROM SHADY GROVE METRO STATION
TO BIGGS FORD ROAD

FLOODPLAINS, MAJOR SURFACE WATER BODIES & WETLANDS

DATE
MAY 2002

FIGURE
III-20
PLATE 3 OF 5


I-270 / US 15 MULTI-MODAL CORRIDOR STUDY
FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD
FLOODPLAINS, MAJOR SURFACE WATER BODIES & WETLANDS
DATE
MAY 2002
FIGURE
III-20
PLATE 4 OF 5
SCALE
0 2500 5000 FEET
0 0.25 0.5 0.75 1 MILE
N
Matchline Plate 3
Matchline Plate 5
Monocacy River
Buckeystown Pike
Baker Valley Rd.
Rock Creek
Carroll Creek
Rosemont Ave.
7th St.
Motter Ave.
W-12W
W-12E
W-11
W-22
W-9W
W-9E
W-8W
W-8E
W-7E
W-7W
Monocacy MARC Station
Frederick MARC Station
MARC
CSX
LEGEND
Transitway
I-270 / US 15 Corridor
Floodplains
Streams
Surface Water
Wetlands



I-270 / US 15 MULTI-MODAL CORRIDOR STUDY

FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD

FLOODPLAINS, MAJOR SURFACE WATER BODIES & WETLANDS

DATE: MAY 2002

FIGURE III-20 PLATE 5 OF 5

Highway Alignment

The highway alignment traverses large perennial stream systems, smaller intermittent tributaries, associated floodplain wetlands, and headwater seeps. In addition, some ditches at the toe of the highway embankment have developed wetland conditions that are hydrologically connected to intermittent and perennial streams. **Table III-41** contains a summary of characteristics associated with each numbered wetland flagged within the highway alignment.

The perennial streams identified within the project area include Muddy Run (W-1), Tuscarora Creek (W-2), Carroll Creek (W-7), Rock Creek (W-7), Monocacy River (W-9), Bennett Creek (W-23 and W-24), Little Bennett Creek (W-34), Wildcat Branch (W-35), Gunners Branch (W-60), Little Seneca Creek (W-53), Great Seneca Creek (W-62, W-62A, and W-62C), and Muddy Branch (W-66). A network of fifty smaller perennial and intermittent streams were also identified along the highway alignment.

Many of the larger floodplains or riparian corridors associated primarily with the perennial streams identified above, are comprised of diverse forested, scrub-shrub, or emergent wetlands. Smaller floodplains associated with intermittent streams also occur along the alignment. Many of these systems have been disturbed by the placement of culverts to convey water beneath existing I-270 and US 15. This has led to the establishment of wetlands on sediment bars where accretion has occurred or to the downcutting of the stream where erosion has occurred. Wetlands within riparian corridors along the highway alignment include those associated with W-2, W-9, W-15W, W-15E, W-17, W-18W, W-18E, W-19S, W-19N, W-20W, W-20E, W-22W, W-23W, W-23E, W-25W, W-25E, W-27W, W-30, W-E35, W-F35, W-H35, W-45W, W-46E, W-49, W-53, W-57W, W-58E, W-62A, W-62C, W-B63W, W-C63E, and W-65.

The dominant vegetation found within the forested portions of the floodplains is red maple, silver maple, spicebush, jewelweed, and stout woodreed. The floodplains comprised of scrub-shrub vegetation are dominated by spicebush, box elder, elderberry jewelweed, fowl manna grass, and soft rush, while the emergent areas are dominated by soft rush, blue-joint grass, spike rush, jewelweed, fowl manna grass, skunk cabbage, and deer-tongue witchgrass.

Soil types within these floodplain wetlands are Baile, Blocktown, Cardiff, Chewacia, Congaree, Duffield, Frankstown, Glenville, Hatboro, Lindside, Manor Melvin, and Worsham. The hydric soils within the Corridor include Baile, Hatboro, Manor, Melvin, and Worsham, while Blocktown, Glenville, and Lindside have the potential for hydric inclusions. Soil samples were gleyed or had a low-chroma matrix with redoximorphic features.

The principle functions associated with these wetlands ranked high for both sediment stabilization and water quality, especially in floodplains that have dense cover types which provide long-term retention and processing of recently deposited sediment. These wetlands are functioning at an intermediate or high level for wildlife habitat due to the available cover types, increased size, and minimal disturbance of these floodplains. Wetlands associated with the Monocacy River (W-9), tributary to Little Seneca Creek (W-50) and Little Seneca Creek (W-52) ranked optimal for the uniqueness/heritage function due to their associations with parks that have

significant aesthetic and historical value (i.e., Monocacy National Battlefield and Black Hill Regional Park).

The seep wetlands situated within the headwaters of tributaries and wetlands associated with roadside drainage ways are primarily emergent or scrub-shrub wetlands. These wetlands appear to have a hydroperiod that is seasonally supported by groundwater discharges. Many of these areas have been disturbed by utility line cuts, cattle grazing, or other human-induced factors. Headwater and roadside seep wetlands are associated with W-3, W-4, W-6E, W-7W, W-22, W-12E, W-13, W-14W, W-16, W-20E, W-26E, W-28, W-29, W-31, W-32, W-36, W-45E, W-A46E, W-47, W-48E, W-50, W-52E, W-55, W-56, W-57E, W-58W, W-58E, W-60E, W-61E, and W-64. The diversity of most of these wetlands is limited due to periodic disruption from the roadway.

The dominant vegetation in the emergent wetlands is cattail, arrow-leaved tearthumb, soft rush, jewelweed, rice cutgrass, and water pepper. The scrub-shrub wetlands are dominated by spicebush, jewelweed, and skunk cabbage.

Soil types within these scrub-shrub and emergent wetlands are Baile, Brinklow-Blocktown, Congaree, Glenville, Hatboro, Lindside, Linganore, Manor, and Worsham. Baile and Hatboro are listed as hydric soils, while Glenville, Lindside and Manor have the potential for hydric inclusions. Soil samples were gleyed or had a low chroma matrix with redoximorphic features.

The principle functions associated with wetlands located in roadside ditches and drainage ways rank intermediate for sediment stabilization and water quality due to their small size, periodic disturbance from the roadway and lack of emergent cover types. The wetlands situated in the headwaters of streams rank slightly higher for these functions as most of these wetlands are located away from the road and experience little to no disturbance. The wildlife functions ranked low for both types of wetlands due to their lack of cover types and isolation from other wetland systems.

TABLE III-41
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-1	R2UB1	Inundated – 3”	N/A			
W-2	PEM1C/E	Saturated	Soft Rush	*Juncus effusus*	Melvin	SS- 0.5
		Inundated – 1”	Meadow Fescue	*Lolium pratense*		WQ- 0.8
		Drainage pattern	Smartweed sp.	*Polygonum sp.*		WL- 0.2
		Oxidized root channels	Red Maple	*Acer rubrum*		
			Green Ash	*Fraxinus pennsylvanica*		
	R4SB1		N/A			
	R2UB1		N/A			
W-3	R4SB2		N/A			
	PEM1C	Inundated - <1”	Broad-leaved Cattail	*Typha latifolia*	Lindside	SS- 0.8
		Saturated	Jewelweed	*Impatiens capensis*		WQ- 0.7
		Drift lines				WL- 0.3
		Oxidized root channels				
W-4E	R2UB1	Inundated – 3”	N/A			
W-4W	PEM2E	Inundated - <1”, Saturated	Blunt Spikerush	*Eleocharis obtusa*	Lindside	SS- 0.7
		Oxidized root channels	Fox Sedge	*Carex vulpinoidea*		WQ- 0.8
			Reed Canary Grass	*Phalaris arundinacea*		WL- 0.2
			Sweet Flag	*Acorus calamus*		
			Fowl Bluegrass	*Poa palustris*		
	R2UB1		N/A			
W-5	R4SB1	Inundated – 3”	N/A			
W-6E	R3UB2		N/A			
	PEM1C	Saturated	Broad-leaved Cattail	*Typha latifolia*	Manor channery and gravelly loams	SS- 0.9
		Inundated – 1-5”	Deertongue Witchgrass	*Dichanthelium clandestinum*		WQ- 0.9
		Drainage patterns	Nightshade	*Solanum dulcamara*		WL- 0.4
W-6W	R3UB1		N/A			

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W –7E	R2UB1		N/A			
W-7W	R4SB3	Inundated – 1”	N/A			
	PEM1A/C	Saturated	Spike Rush	*Eleocharis* sp.	Duffield &	SS- 0.8
			Soft Rush	*Juncus effusus*	Frankstown	WQ- 0.9
	PEM1E	Drift lines	Wool Grass	*Scirpus cyperinus*		WL- 0.1
		Drainage patterns	Grass sp.	*Gramineae* sp.		
W-8	R4SB1	Inundated – 4”	N/A			
W-9E	R2UB1		N/A			
W-9W	PFO1A/C	Drift lines	Red Maple	*Acer rubrum*	Lindside	SS- 0.9
		Sediment deposits	Silver Maple	*Acer saccharinum*		WQ- 0.8
		Drainage patterns	Box Elder	*Acer negundo*		WL- 0.6
			Spring Beauty	*Claytonia virginica*		FS- 0.7
			Reed Canary Grass	*Phalaris arundinacea*		UH- 1.0
			Virginia Bluebells	*Mertensia virginica*		
	PSS1A/C	Inundated – 8”	Box Elder	*Acer negundo*		
		Water marks	Moneywort	*Lysimachia nummularia*		
		Drainage patterns				
		Saturated				
		Water-stained leaves				
W-11	R4SB1	Inundated - 4”	N/A			
W-22	PFO1C	Inundated –4”	Silver Maple	*Acer saccharinum*	Cardiff channery loam	SS- 0.6
		Saturated	Poison Ivy	*Toxicodendron radicans*		WQ- 0.7
		Water marks	Slippery Elm	*Ulmus rubra*		WL- 0.5
		Drainage patterns				U/H- 1.0

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-12W	R4SB1		N/A			
W-12E	PFO1C	Inundated - 6”	Green Ash	*Fraxinus pennsylvanica*	Congaree silt loam	SS- 0.5
		Saturated	Black Gum	*Nyssa sylvatica*		WQ- 0.6
		Water marks	Soft Rush	*Juncus effusus*		WL- 0.5
W-13	R3UB1		N/A			
	PEM1E	Saturated	No vegetation present. Wetland designation assumes vegetation will emerge during growing season.		Congaree silt loam	SS- 0.8
		Inundated - 2”				WQ- N/A
		Drainage patterns				WL- 0.1
W-14E	R4SB1		N/A			
W-14W	R4SB1		N/A			
	PSS1E	Saturated (water @ 5”)	Spicebush	*Lindera benzoin*	Manor channery & gravelly loams	SS-0.7
		Inundated - 1”	Multiflora Rose	*Rosa multiflora*		WQ- 0.5
		Drainage pattern	Jewelweed	*Impatiens capensis*		WL- 0.5
		Oxidized root channels	Manna Grass	*Glyceria striata*		
			Sedge	*Carex* sp.		
W-15W	R4SB1		N/A			
	PFO1C/E	Inundated - 0.5”	Silver Maple	*Acer saccharinum*	Glenville silt loam	SS- 0.8
		Saturated	Spicebush	*Lindera benzoin*		WQ- 0.8
		Drainage patterns	Panic Grass	*Dichanthelium clandestinum*		WL- 0.4
		Oxidized root channels	Sedge	*Carex* sp.		
W-15E	R4SB1		N/A			
	PEM1C/E	Inundated - 1”	Blue-joint Grass	*Calamagrostis canadensis*		SS- 0.8
		Saturated	Sedge	*Carex* sp.		WQ- 0.9
		Oxidized root channels	Soft Rush	*Juncus effusus*		WL- 0.2
			Jewelweed	*Impatiens capensis*		

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-16	PEM2B/E	Inundated - 1”	Sedge	*Carex* sp.	Manor channery & gravelly loams	SS- 1.0
		Saturated	Blue-joint Grass	*Calamagrostis canadensis*		WQ- 0.7
		Drainage patterns	Spike Rush	*Eleocharis obtusa*		WL- 0.3
			Soft Rush	*Juncus effusus*		
W-17	PEM1C/E	Inundated - 1”	Soft Rush	*Juncus effusus*	Glenelg & Chester silt loams	SS- 0.5
		Saturated	Broad-leaved Cattail	*Typha latifolia*		WQ- N/A
		Drainage patterns	Wool Grass	*Scirpus cyperinus*		WL- 0.2
			Sensitive Fern	*Onoclea sensibilis*		
W-18W	R3UB1		N/A			
	R4SB3		N/A			
	PEM2B/E	Inundated - 1”	Jewelweed	*Impatiens capensis*	Worsham silt loam	SS- 0.7
		Saturated	Blue-joint Grass	*Calamagrostis canadensis*		WQ- 0.9
		Water marks				WL- 0.4
	PFO1E	Saturated	Silky Dogwood	*Cornus amomum*		SS- 0.9
			Sedge	*Carex* sp.		WQ- 1.0
			Grass	Gramineae sp.		WL- 0.6
			Jewelweed	*Impatiens capensis*		
W-18E	PSS2B/E	Drainage patterns	Red Maple	*Acer rubrum*		SS- 0.8
		Oxidized root channels	Spicebush	*Lindera benzoin*		WQ- 1.0
	R3UB1		N/A			WL- 0.3
	R4SB3		N/A			

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-19S	R2UB2		N/A			
	PSS1E	Inundated - 1”	Silky Dogwood	*Cornus amomum*	Worsham silt loam	SS- 0.8
		Saturated	Goldenrod	*Solidago* sp.		WQ- 0.8
		Drainage patterns	Soft Rush	*Juncus effusus*		WL- 0.5
		Oxidized root channels	Swamp Milkweed	*Asclepias incarnata*		
			Teasel	*Dipsacus sylvestris*		
W-19N	R2UB2		N/A			
	PSS1E	Inundated - 1”	Spicebush	*Lindera benzoin*		
		Saturated	Black Willow	*Salix nigra*		
		Drainage patterns	Blue-joint Grass	*Calamagrostis canadensis*		
W-20W	R2UB1		N/A			
	R4SB2		N/A			
	PSS1E	Inundated - 1-4”	Spicebush	*Lindera benzoin*	Manor channery & gravelly loams	SS- 0.7
		Saturated	Sedge	*Carex* sp.		WQ- 0.9
		Drainage patterns	Jewelweed	*Impatiens capensis*		WL- 0.5
		Water marks	Blue-joint Grass	*Calamagrostis canadensis*		
		Drift lines				
W-20E	PEM2B/E		Jewelweed	*Impatiens capensis*		SS-0.7
			Blue-joint Grass	*Calamagrostis canadensis*		WQ- 0.9
						WL- 0.4
	PEM1C/E	Sediment deposits	Broad-leaved Cattail	*Typha latifolia*	Manor channery & gravelly loams	SS-1.0
			Sedge	*Carex* sp.		WQ- 1.0
	PFO1C/E	Inundated - 1-4”	Silver Maple	A*cer saccharinum*	Worsham silt loam	SS- 0.7
		Saturated	Poison Ivy	*Toxicodendron radicans*		WQ- 0.7
		Water marks	Stout Woodreed	*Cinna arundinacea*		WL- 0.5
W-21	R4SB1	Inundated – 2”	N/A			

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-22W	R3UB1		N/A		Mixed alluvial	
	PSS1E	Inundated - 0.5”	Spicebush	*Lindera benzoin*	Cardiff channery loam	SS- 0.8
		Saturated	False Nettle	*Boehmeria cylindrica*		WQ- 0.9
		Drainage patterns	Fowl Manna Grass	*Glyceria striata*		WL- 0.7
			Jewelweed	*Impatiens capensis*		
W-22E	R4SB1		N/A			
W-23W	PEM1B	Inundated – 1”	Cattail	*Typha latifolia*	Chewacia silt loam	SS- 0.8
		Saturated	Jewelweed	*Impatiens capensis*		WQ- 0.9
		Drainage patterns	Fowl Manna Grass	*Glyceria striata*		WL- 0.4
W-23E	PEM1/2C	Water marks	Nepal Microstegium	*Microstegium viminea*		SS- O.8
		Drift lines	New England Aster	*Aster novae-angliae*		WQ- 0.9
		Sediment deposits	Broad-leaf cattail	*Typha latifolia*		WL- 0.3
		Oxidized root channels	Jewelweed	*Impatiens capensis*		
			Soft Rush	*Juncus effusus*		
			Deertongue Witchgrass	*Dichanthelium clandestinum*		
W-24	R2UB2/3	Inundated – 1’	N/A			
W-25W	R3UB1		N/A			
	PEM2E	Inundated – 1”	Rice Cutgrass	*Leersia oryzoides*	Chewacia silt loam	SS- 0.9
		Saturated	Jewelweed	*Impatiens capensis*		WQ- 0.9
			Fowl Manna Grass	*Glyceria striata*		WL- 0.4
			Asiatic Tearthumb	*Polygonum perfoliatum*		
			Water Cress	*Nasturtium officinale*		
W-25E	R3UB1		N/A			
	PEM2C	Saturated	Smartweed	*Polygonum* sp.		SS- 0.8
		Drainage patterns	Jewelweed	*Impatiens capensis*		WQ- 0.9
			Arrowleaved Tearthumb	*Polygonum sagittatum*		WL- 0.2
			Deertongue Witchgrass	*Dichanthelium clandestinum*		

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-26E	R3UB1		N/A			
	PEM2B	Inundated- 2”	Jewelweed	*Impatiens capensis*	Chewacia silt loam	SS- 0.8
		Water marks	Arrowleaved Tearthumb	*Polygonum sagittatum*		WQ- 0.9
		Sediment deposits	Water Pepper	*Polygonum hydropiper*		WL- 0.4
W-26W	R3UB1		N/A			
W-27E	R3UB1		N/A			
W-27W	R3UB1		N/A			
	PEM2E	Inundated – 1-5”	Sensitive Fern	*Onoclea sensibilis*	Manor channery and gravelly loams	SS- 0.7
		Saturated	Jewelweed	*Impatiens capensis*		WQ- 0.8
		Drainage patterns	Goldenrod	*Solidago* sp.		WL- 0.4
	PSS1E	Inundated – 1-5”	Box Elder	*Acer negundo*	Manor channery and gravelly loams	SS- 0.9
		Saturated	Spicebush	*Lindera benzoin*		WQ- 0.9
		Drainage patterns	Jewelweed	*Impatiens capensis*		WL- 0.1
			Fowl Manna Grass	*Glyceria striata*		
W-28	POW	Inundated - >1’				
	PEM2C/E	Saturated	Blunt Spikerush	*Elocharis obtusa*	Linganore channery and gravelly loams	SS- 0.9
		Shallow Inundation; seeps enter pond from above, swales drain pond below.	Water Purslane	*Ludwigia palustris*		WQ- N/A
			Soft Rush	*Juncus effusus*		WL- 0.2
			Canada Rush	*Juncus canadensis*		
			Green Bulrush	*Scirpus atrovirens*		
			Woolgrass	*Scirpus cyperinus*		
			Jewelweed	*Impatiens capensis*		
			Fowl Manna Grass	*Glyceria striata*		

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-29	PEM2B	Inundated -<1” Saturated Drainage patterns	Rice Cutgrass Jewelweed Shallow Sedge	*Leersia oryzoides* *Impatiens capensis* *Carex lurida*	Linganore channery and gravelly silt loam	SS- 0.7 WQ- 0.8 WL- 0.2
W-30	R3UB1 PFO1E	Inundated – <0.5” Saturated Drainage patterns Water marks	N/A Red Maple Sycamore Spicebush Jewelweed Fowl Manna Grass	 *Acer rubrum* *Platanus occidentalis* *Lindera benzoin* *Impatiens capensis* *Glyceria striata*	Manor channery and gravelly loam	SS- 0.8 WQ- 0.9 WL- 0.2
W-31	R4SB1 PSS1E	Inundated – 1” Saturated Water in pit – 16” Drainage patterns	N/A Spicebush Redtop Grass Nepal Microstegium	 *Lindera benzoin* *Agrostis alba* *Microstegium viminea*	Blocktown channery silt loam	SS- 0.9 WQ- 0.9 WL- 0.3
W-32	PEM2E	Saturated Oxidized root channels	Jewelweed Arrowleaved Tearthumb Nepal Microstegium Tall Goldenrod Pointed broom sedge	*Impatiens capensis* *Polygonum sagittatum* *Microstegium viminea* *Solidago gigantea* *Carex scoparia*	Blocktown channery silt loam	SS- 0.8 WQ- 0.9 WL- 0.2
W-33	R3UB1	Inundated – 1-2”	N/A			
W-34	R3UB1	Inundated – 2-36”	N/A			

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-A35	R3UB1		N/A			
W-C35	R3UB2		N/A			
W-D35	R3UB2		N/A			
W-E35	R3UB2		N/A			
	PSS1E	Saturated	Spicebush	*Lindera benzoin*	Hatboro silt loam,	SS- 0.9
		Drainage patterns	Sweet Pepperbush	*Clethra alnifolia*	Brinklow-Blocktown channery silt loam,	WQ- 0.8
		Oxidized root channels	Elderberry	*Sambucus canadensis*		WL- 0.2
			Arrowwood	*Viburnum dentatum*	Baile silt loam,	
	PEM1/2/C/E		Skunk Cabbage	*Symplocarpus foetidus*	Hyattstown channery silt loam	SS- 0.8
			Jewelweed	*Impatiens capensis*		WQ- 0.9
			Fowl Manna Grass	*Glyceria striata*		WL- 0.1
			Sensitive Fern	*Onoclea sensibilis*		
			Poison Ivy	*Toxicodendron radicans*		
	R3UB2		N/A			
W-F35	PEM2C/E	Drift Lines	Jewelweed	*Impatiens capensis*		
			Soft rush	*Juncus effusus*	Hyattstown channery silt loam	
			Marsh pepper	*Polygonum hydropiper*		
			Rice cutgrass	*Leersia oryzoides*		
			Frank's sedge	*Carex frankii*		
W-G35	R3UB1		N/A			
W-H35	PEM1/2C/E	Drainage pattern in wetland	Deer-tounge witchgrass	*Dichanthelium clandestinum*	Brinklow-Blocktown channery silt loam	
			Fowl manna grass	*Glyceria striata*		
			Frank's sedge	*Carex frankii*		
			Soft rush	*Juncus effusus*		
			Meadow fescue	*Lolium pratense*		
			Cockle-bur	*Xanthium* sp.		

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-36	R3UB1		N/A			
	PSS1E	Inundated – 0.5”	Jewelweed	*Impatiens capensis*	Brinklow-Blocktown	SS- 0.8
		Saturated	Spicebush	*Lindera benzoin*	channery silt loam	WQ- 0.9
			Fowl Manna Grass	*Glyceria striata*		WL- 0.4
W-38	R4SB1/3	Inundated – 0.5”	N/A			
W-39	PEM2E	Inundated – 0.5”	Soft Rush	*Juncus effusus*	Glenville silt loam	SS- 0.5
		Saturated	Blunt Spikerush	*Eleocharis obtusa*		WQ- 1.0
			Arrowleaved Tearthumb	*Polygonum sagittatum*		WL- 0.2
			Water Plantain	*Alisma subcordatum*		
			Redtop Grass	*Agrostis alba*		
W-41	R4SB1	Dry bed	N/A			
W-42	R4SB1	Dry bed	N/A			
W-43	R3UB1	Inundated – 1.5”	N/A			
W-44	R3UB1	Inundated – 1”	N/A			
W-45W	R4SB1	Cobble/gravel	N/A			
	PFO1E	Drift lines	Green Ash	*Fraxinus pennsylvanica*	Hatboro silt loam	SS- 0.8
		Drainage patterns in	Spicebush	*Lindera benzoin*		WQ- 1.0
		wetland	Japanese Honeysuckle	*Lonicera japonica*		WL- 0.3
			Garlic Mustard	*Alliaria officinalis*		
			Poison Ivy	*Toxicodendron radicans*		
W-45E	R4SB1		N/A			SS- 0.9
	PEM2E	Drainage patterns	Rice Cutgrass	*Leersia oryzoides*		WQ- 0.9
		Oxidized root channels	Smartweed	*Polygonum* sp.		WL- 0.1

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-46E	R2UB1		N/A			
	PEM1/2E	Saturated	Flattop Goldennrod	*Euthamia graminifolia*	Hatboro silt loam	SS- 0.9
		Drainage patterns	Deertongue Witchgrass	*Dichanthelium clandestinum*		WQ- 0.9
			Soft Rush	*Juncus effusus*		WL- 0.2
			Redtop Grass	*Agrostis alba*		
W-A46E	PEM1A	Inundated - <0.5”	Green Bulrush	*Scirpus atrovirens*		SS- 0.9
		Saturated	Soft Rush	*Juncus effusus*		WQ- N/A
						WL- 0.1
W-47	R3UB1		N/A			
	PEM1/2E	Inundated -1”	Red Maple	*Acer rubrum*	Hatboro silt loam	SS-0.9
	PFO1E	Saturated	Soft Rush	*Juncus effusus*		WQ- 0.9
			Deertongue Witchgrass	*Dichanthelium clandestinum*		WL- 0.2
			Reed Canary Grass	*Phalaris arundinacea*		
W-48W	R3UB1		N/A			
W-48E	PEM1E	Inundated – 1-2”	Broad-leaf cattail	*Typha latifolia*	Baile silt loam	SS- 0.9
		Saturated	Sensitive Fern	*Onoclea sensibilis*		WQ- 1.0
		Sediment deposits	Soft Rush	*Juncus effusus*		WL- 0.2
			Arrowleaved Tearthumb	*Polygonum sagittatum*		
W-49	R3UB1		N/A			
	PFO1C/E	Inundated – 1-2”	Red Maple	*Acer rubrum*	Hatboro silt loam	SS- 0.8
		Saturated	Spicebush	*Lindera benzoin*		WQ- 1.0
		Drainage patterns	Duck Potato	*Sagittaria latifolia*		WL- 0.6
			Jewelweed	*Impatiens capensis*		
			Sensitive Fern	*Onoclea sensibilis*		
			Fowl Manna Grass	*Glyceria striata*		

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-49	PSS1E	Inundated – 1-2”	Skunk Cabbage	*Symplocarpus foetidus*	Hatboro silt loam	SS- 0.7
		Saturated	Elderberry	*Sambucus canadensis*		WQ- 0.8
		Drainage Patterns	Silky Dogwood	*Cornus amomum*		WL- 0.6
			Smooth Alder	*Alnus serrulata*		
			Water Plantain	*Alisma subcordatum*		
			Arrowleaved Tearthumb	*Polygonum sagittatum*		
			Water Pepper	*Polygonum hydropiper*		
			Soft Rush	*Juncus effusus*		
			Rice Cutgrass	*Leersia oryzoides*		
			Flattop Goldenrod	*Euthamia graminifolia*		
			Frank’s Sedge	*Carex frankii*		
W-50	R3UB1		N/A		Mixed alluvial	
	PSS1B	Depth to water in pit – 7”	Whitegrass	*Leersia virginica*	Hatboro silt loam	SS- 0.8
		Saturated	Halberdleaved tearthumb	*Polygonum arifolium*		WQ- 0.9
		Drainage patterns	Moneywort	*Lysimachia nummularia*		WL- 0.5
		Water-stained leaves	Spicebush	*Lindera benzoin*		U/H- 1.0
			Winterberry	*Ilex verticillata*		
W-51	R3UB1	Inundated – 1-6”	N/A		Mixed alluvial	
W-52W	R2UB1		N/A			
W-52E	R2UB1		N/A			
	PEM1/2C/E	Saturated	Rice Cutgrass	*Leersia oryzoides*	Hatboro silt loam	SS- 1.0
		Sediment deposits	Arrowleaved Tearthumb	*Polygonum sagittatum*		WQ- 1.0
		Drainage patterns in wetland	Soft Rush	*Juncus effusus*		WL- 0.7
			Shallow Sedge	*Carex lurida*		U/H- 1.0
			Jewelweed	*Impatiens capensis*		

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-53	PFO1C	Saturated Sediment deposits	Yellow Poplar Red Maple Spicebush False Nettle Lady's Thumb Nepal Microstegium Skunk Cabbage	*Liriodendron tulipifera* *Acer rubrum* *Lindera benzoin* *Boehmeria cylindrica* *Polygonum persicaria* *Microstegium viminea* *Symplocarpus foetidus*	Hatboro silt loam	SS- 0.7 WQ- 0.8 WL- 0.5
W-54	R4SB1	Inundated -1"	N/A			
W-55	PEM1/2C/E	Sediment deposits Drainage patterns	Rice Cutgrass Water Pepper Water Purslane Blunt Spikerush Straw-colored Sedge Deertongue Witchgrass	*Leersia oryzoides* *Polygonum hydropiper* *Ludwigia palustris* *Eleocharis obtusa* *Cyperus strigosus* *Dichanthelium clandestinum*	Glenville silt loam	SS- 0.9 WQ- 0.9 WL- 0.2
W-56	PEM1E	Inundated – <1" Saturated Sediment deposits Drainage patterns Oxidized root channels	Fowl Manna Grass Arrowleaved Tearthumb Rice Cutgrass Broad-leaf cattail	*Glyceria striata* *Polygonum sagittatum* *Leersia oryzoides* *Typha latifolia*	Baile silt loam	SS- 0.9 WQ- 0.9 WL- 0.2

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-57W	R3UB1		N/A		Mixed alluvial	
	PFO1A	Inundated – 6”	Red Maple	*Acer rubrum*	Hatboro silt loam	SS-0.8
		Drainage patterns	Sycamore	*Platanus occidentalis*		WQ- 0.9
		Sediment deposit	Black Willow	*Salix nigra*		WL- 0.5
			Ironwood	*Carpinus caroliniana*		
			Whitegrass	*Leersia virginica*		
			Jewelweed	*Impatiens capensis*		
			Water Purslane	*Ludwigia palustris*		
			False Nettle	*Boehmeria cylindrica*		
			Aster	*Aster* sp.		
			Goldenrod	*Solidago* sp.		
			Bugleweed	*Lycopus americanus*		
			Black Willow	*Salix nigra*		
W-57E	PSS1E/F	Inundated - <1”	Arrowwood	*Viburnum dentatum*	Hatboro silt loam	SS- 0.8
		Saturated	Elderberry	*Sambucus canadensis*		WQ- 0.9
			Fowl Manna Grass	*Glyceria striata*		WL- 0.5
			Rice Cutgrass	*Leersia oryzoides*		U/H- 1.0
			Water Pepper	*Polygonum hydropiper*		
			Jewelweed	*Impatiens capensis*		
			Sensitive Fern	*Onoclea sensibilis*		

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-58W	PEM1B	Inundated – 3”	Rice Cutgrass	*Leersia oryzoides*	Baile silt loam	SS- 0.9
		Saturated	Broad-leaf cattail	*Typha latifolia*		WQ- 0.8
		Drainage patterns	Goldenrod	*Solidago* sp.		WL- 0.2
			Aster	*Aster* sp.		
			Tickseed Sunflower	*Bidens aristosa*		
			Water Purslane	*Ludwigia palustris*		
			Arrowleaved Tearthumb	*Polygonum sagittatum*		
			Jewelweed	*Impatiens capensis*		
			Black Willow	*Salix nigra*		
			Soft Rush	*Juncus effusus*		
W-58E	PFO1A	Dry during visit	Pin Oak	*Quercus palustris*	Baile silt loam	SS- 0.8
		Seasonal high water	Persimmon	*Diospyros virginiana*		WQ- 0.9
		table	Black Willow	*Salix nigra*		WL- 0.5
			Spicebush	*Lindera benzoin*		
			Elderberry	*Sambucus canadensis*		
			Multiflora Rose	*Rosa multiflora*		
			Blackberry	*Rubus allegheniensis*		
			Sensitive Fern	*Onoclea sensibilis*		
			Arrowleaved Tearthumb	*Polygonum sagittatum*		
			White Avens	*Geum canadense*		
			False Nettle	*Boehmeria cylindrica*		
	PEM1/2E	Water marks	Broad-leaf cattail	*Typha latifolia*		SS- 0.8
		Drift lines	Water Purslane	*Ludwigia palustris*		WQ- 0.9
		Sediment deposits	Soft Rush	*Juncus effusus*		WL- 0.3
			Blunt Spikerush	*Eleocharis obtusa*		
			Blue Vervain	*Verbena hastada*		
W-59	R4SB1	Dry	N/A			

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-60W	R3UB1		N/A			
W-60E	PFO1C/E	Inundated – 1-6”	Yellow Poplar	*Liriodendron tulipifera*	Hatboro silt loam	SS- 0.8
		Saturated	Green Ash	*Fraxinus pennsylvanica*		WQ- 1.0
		Drift lines	Spicebush	*Lindera benzoin*		WL- 0.3
		Sediment deposits	Arrowwood	*Viburnum dentatum*		
		Drainage patterns	Japanese Honeysuckle	*Lonicera japonica*		
			Stout Woodreed	*Cinna arundinacea*		
W-A61W	R4SB1	Inundated – 4”	N/A			
W-B61W	R2UB1		N/A			
W-61E	R2UB1		N/A			
	PSS1E	Saturated	Skunk Cabbage	*Symplocarpus foetidus*	Blocktown silt loam	SS- 0.8
		Drainage patterns	Spicebush	*Lindera benzoin*		WQ- 0.8
		Water-stained leaves				WL- 0.3
W-62	R2UB1	Inundated – >6”	N/A		Mixed alluvial	
W-62A	PEM1A	Saturated	Arrowleaved Tearthumb	*Polygonum*	Hatboro silt loam	SS- 0.9
		Depth to water in pit	Barnyard Grass	*Echinocloa crus-galli*		WQ- 0.9
		– 12”	Rice Cutgrass	*Leersia oryzoides*		WL- 0.2
		Water-stained leaves	Soft Rush	*Juncus effusus*		
	PFO1A	Drainage patterns	Green Ash	*Fraxinus pennsylvanica*		SS- 0.9
			Red Maple	*Acer rubrum*		WQ- 1.0
			Winterberry	*Ilex verticillata*		WL- 0.5
			Arrowwood	*Viburnum dentatum*		
			Stout Woodreed	*Cinna arundinacea*		
W-62C	PEM1A	Dried cracked mud	Skunk Cabbage	*Symplocarpus foetidus*	Hatboro silt loam	SS- 0.6
			Soft Rush	*Juncus effusus*		WQ- 0.8
			Whitegrass	*Leersia virginica*		WL- 0.3

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-62C	PFO1A	Drainage patterns	Green Ash	*Fraxinus pennslvanica*	Hatboro silt loam	SS- 0.8
		Dried cracked mud	Red Maple	*Acer rubrum*		WQ- 1.0
			Pin Oak	*Quercus palustris*		WL- 0.3
			Sycamore	*Platanus occidentalis*		
			Box Elder	*Acer negundo*		
			Garlic Mustard	*Alliaria petiolata*		
			False Nettle	*Boehmeria cylindrica*		
			Water Pepper	*Polygonum hydropiperoides*		
W-A63W	R3UB1	Inundated –1-6”	N/A			
W-B63W	R3UB1/2		N/A			
	PFO1A/C/B /F	Inundated – 0-1”	Pin Oak	*Quercus palustris*	Hatboro silt loam	SS- 0.8
		Saturated	Black Willow	*Salix nigra*		WQ- 0.9
		Drift lines	Sycamore	*Platanus occidentalis*		WL- 0.5
		Sediment deposits	Black Gum	*Nyssa sylvatica*		
		Drainage patterns	Red Maple	*Acer rubrum*		
			Black Haw	*Viburnum prunifolium*		
			Spicebush	*Lindera benzoin*		
			Multiflora Rose	*Rosa multiflora*		
			False Nettle	*Boehmeria cylindrica*		
			Nepal Microstegium	*Microstegium viminea*		
			Stout Woodreed	*Cinna arundinacea*		
			Garlic Mustard	*Aliaria officinales*		
			Skunk Cabbage	*Symplocarpus foetidus*		
			Tussock Sedge	*Carex crinita*		

TABLE III-41 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-A63E	R3UB1		N/A			
W-B63E	R3UB1		N/A			
W-C63E	PEM1A	Inundated – 1-2”	Arrowleaved Tearthumb	*Polygonum sagittatum*	Baile silt loam	Baile silt loam
		Saturated	Blue Vervain	*Verbena hastata*		
			Straw-colored Sedge	*Cyperus strigosus*		
			Soft Rush	*Juncus effusus*		
			Jewelweed	*Impatiens capensis*		
			Black Willow	*Salix nigra*		
			Water Pepper	*Polygonum hydropiper*		
W-64	PEM1/2F	Inundated – 4”	Broad-leaf cattail	*Typha latifolia*	Baile silt loam	SS- 0.9
		Saturated	Black Willow	*Salix nigra*		WQ- N/A
		Water marks	Soft Rush	*Juncus effusus*		WL- 0.3
	PEM1/2F	Drainage patterns	Rice Cutgrass	*Leersia oryzoides*	Baile silt loam	SS- 0.9
			Redtop Grass	*Agrostis alba*		WQ- N/A
			Water Pepper	*Polygonum hydropiper*		WL- 0.3

TABLE III-41 CONTINUED
WETLANDS AND WATERS OF THE US WITHIN THE HIGHWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-65	R3UB1	Inundated – 4”	N/A			
	R4SB2	Inundated – 1”	N/A			
	PSS1A		Broad-leaf cattail	*Typha latifolia*	Baile slit loam	SS- 0.9
			Black Willow	*Salix nigra*		WQ- 0.9
			Jewelweed	*Impatiens capensis*		WL- 0.6
			Red Maple	*Acer rubrum*		
W-66	R3UB1	Inundated – 1-6”	N/A			

Notes:

* *The functional assessment score is a number from 0.0-1.0, which describes a wetland’s relative capacity to perform a function, where 0.0 represents no functional capacity and 1.0 represents optimal functional capacity.*

SBEC -- Shoreline Bank Erosion Control
SS -- Sediment Stabilization
WQ -- Water Quality
UH -- Uniqueness/Heritage
FS -- Fish (Non-tidal Stream)

Park and Ride Lots

A desktop survey was conducted using DNR Nontidal Wetland Guidance Maps to identify potential wetlands and waterways within the proposed park and ride lots at Biggs Ford Road, Liberty Road, and Trading Lane. Park and ride lots at MD 124 and MD 117 are part of a separate project. Potential park and ride lots at Observation Drive, MD 75, MD 144, and West 7th Street have not yet been specifically sighted or designed pending studies to determine their need. Field verification of potential wetland areas at the Biggs Ford Road, Liberty Road, and Trading Lane sites was conducted in August 2001 with only dominant vegetation and hydrology being recorded at each site. A routine wetland delineation was not conducted nor were wetlands flagged. A detailed assessment of these wetland areas is needed when these park and ride lots are finalized during the planning process.

There were no wetlands and waterways identified within the proposed park and ride lots at Liberty Road and Biggs Ford Road. A palustrine emergent wetland was identified within the site at Trading Lane. This wetland extends northeast through the site along a tributary to Tuscarora Creek that joins the mainstem on the west side of US 15. The tributary has filled in with sediment due to the adjacent construction site and vegetation has established in these areas. During the site visit, soils were saturated in the upper 12 inches of the soil profile. The dominant vegetation in the wetland consists of broad-leaf cattail, path rush, swamp milkweed, American burreed, short-point flatsedge, and purple-leaf willow-herb. Soils in this area are mapped as Baile silt loam, which is considered hydric by NRCS. The principal functions associated with this wetland system ranked high for sediment stabilization and water quality. Functions associated with wildlife habitat ranked average due to the lack of available cover types.

Transitway Alignment

The USACOE and MDE have taken jurisdiction over 17 wetland areas within the transitway alignment. Characteristics of these areas are summarized in **Table III-42**. Eleven Waters of the US were identified along the alignment, some with palustrine forested, scrub-shrub, or emergent wetlands associated with their fringes. Two palustrine scrub-shrub/emergent wetlands (W-103 and W-108) situated within the alignment are associated with streams that flow outside of the project area.

A majority of the perennial and intermittent streams and adjacent fringe wetlands (W-101, W-104, W-156, W-155, W-154, W-152, W-151, W-150) occur within roadside drainage ways and ditches that flow to Little Seneca Creek, Great Seneca Creek, Gunners Branch (W-104), Muddy Branch (W-109), and Watts Branch. The dominant vegetation within the forested wetland (W-152 and W-150) is black willow, red maple, pin oak, silky dogwood, southern arrowwood, sedge, ground ivy and jewelweed. The scrub-shrub and emergent wetlands are dominated by black willow, red maple, soft rush, white grass, rice cutgrass and cattail. Soil types mapped within these streams and wetland systems include Baile and Hatboro. Both soil types are listed as hydric soils in Maryland. Soil samples exhibited a low-chroma matrix with well defined redoximorphic features. The principle functions associated with these wetlands ranked above intermediate for sediment stabilization and water quality due to their ability to provide short-term

sediment retention. The wildlife functions ranked low due to frequent disturbance from the roadway and lack of available cover types.

W-102 is a very diverse wetland with emergent, scrub-shrub and forested wetland components situated in the floodplains of an intermittent and perennial tributary of Great Seneca Creek. The dominant vegetation in this wetland is sycamore, red maple, highbush blueberry, winterberry, spicebush, stout woodreed, skunk cabbage, white grass, and false nettle. Soils in this wetland are mapped as Blocktown and Gaila. Neither soil is listed as a hydric soil in Maryland, however, both have the potential for hydric inclusions. The principle functions associated with this wetland rank high for sediment stabilization and water quality due to long-term retention and processing of sediment. The wildlife functions ranked intermediate because the wetland is located in an undeveloped portion of the alignment where forested tracts and wetlands are contiguous.

W-103 and W-108 are classified as scrub-shrub wetlands that are associated with streams that originate outside of the project area. The dominant vegetation in these wetlands is black willow, elderberry, soft rush, rice cutgrass, wool grass, monkey flower, seed box, deertongue witchgrass, fall panic grass, arrow-leaved tearthumb, and false nettle. Soil types in the wetland are mapped as Wheaton-Urban Land Complex and Hatboro. Hatboro is listed as a hydric soil in Maryland. The principle functions associated with sediment stabilization and water quality ranked high, while wildlife functions ranked intermediate.

W-62A and W-62C are wetlands located within both the highway and transitway alignments. Refer to the highway alignment discussion for an assessment of the characteristics of wetlands W-62A and W-62C.

Proposed Transit Stations and Yard/Shop Facilities

A field reconnaissance of wetlands and waterways was conducted in August and September 2001 for the proposed major transit stations at COMSAT, Decoverly, Quince Orchard Park/Sioux Lane, National Institute of Science and Technology, Washingtonian, Middlebrook, Germantown, Cloverleaf, Manekin, Century Boulevard, and Crystal Rock Drive. The DNR Nontidal Wetland Guidance Maps were used in the field to verify the occurrence of wetlands and waterways within these potential sites. A routine wetland delineation was not conducted but dominant vegetation and hydrology were noted. A wetland delineation will need to be conducted later in the planning process as these transit station locations become finalized.

Most of the proposed stations that were reviewed in the field are currently being used as existing parking lots for commercial complexes or converted into townhome/condominium communities. Therefore, wetlands and waterways do not occur within these proposed station locations. These stations include Comsat, Metropolitan Grove, Washingtonian, Middlebrook, Germantown, Cloverleaf, Manekin, Century Boulevard, and Crystal Rock Drive.

TABLE III-42
WETLANDS AND WATERS OF THE US WITHIN THE TRANSITWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-100	R2UB1	Inundated – 1-12”	N/A			
W-101	PEM1C/E	Inundated – 12”	Soft Rush	*Juncus effusus*	Hatboro silt loam	SS- 0.8
		Drainage Pattern	Meadow Fescue	*Lolium pratense*		WQ- 0.78
	R2UB1		N/A			WL- 0.1
W-102	R4SB1/2	Mixed alluvial	N/A			
	R2UB1/2	Mixed alluvial	N/A			
	PSS1C/E	Inundated – 1”	Spicebush	*Lindera benzoin*	Blocktown channery	SS- 0.8
		Saturated	Winterberry	*Ilex verticillata*	w/ Baile inclusion	WQ- 0.8
		Drainage patterns	Skunk Cabbage	*Symplocarpus foetidus*		WL- 0.5
			Whitegrass	*Leersia virginica*		
			False Nettle	*Boehmeria cylindrica*		
			Cinnamon Fern	*Osmunda cinnamomea*		
	PEM1C/E	Water-stained leaves	Skunk Cabbage	*Symplocarpus foetidus*	Blocktown channery	SS- 0.8
			Christmas Fern	*Polystichum acrostichoides*	w/ Baile inclusion	WQ- 0.9
			Stout Woodreed	*Cinna arundinacea*		WL- 0.3
	PSS1E	Drainage pattern	Winterberry	*Ilex verticillata*	Blocktown channery	SS- 0.8
		Water-stained leaves	Black Gum	*Nyssa sylvatica*	w/ Baile inclusion	WQ- 0.9
			Skunk Cabbage	*Symplocarpus foetidus*		WL- 0.3
			Highbush Blueberry	*Vaccinium corymbosum*		
	PFO1C/E	Inundated – 1”	Sycamore	*Platanus occidentalis*	Gaila silt loam w/ Baile inclusion	SS- 0.8
		Saturated	Red maple	*Acer rubrum*		WQ- 0.8
		Drainage patterns	Winterberry	*Ilex verticillata*		WL- 0.6
		Water-stained leaves	Spicebush	*Lindera benzoin*		
			Stout Woodreed	*Cinna arundinacea*		

TABLE III-42 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE TRANSITWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-103	PSS1C	Inundated – <1” Saturated Drainage patterns Oxidized root channels	Broad-leaved cattail Soft rush Rice cutgrass Arrowleaved tearthumb False nettle Shallow sedge Elderberry Black willow	*Typha latifolia* *Juncus effusus* *Leersia oryzoides* *Polygonum sagittatum* *Boehmeria cylindrica* *Carex lurida* *Sambucus canadensis* *Salix nigra*	Wheaton-Urban Land Complex	SS- 0.82 WQ- 0.92 WL- 0.56
W-104	R2UB1 PSS1A/C	Inundated – 1-6” Saturated Drainage patterns	N/A Black Willow Red Maple White Grass	 *Salix nigra* *Acer rubrum* *Leersia virginica*	Hatboro	 SS- 0.7 WQ- 0.7 WL- 0.3
W-105	R2UB1	Inundated – 1”-2’	N/A			
W-106	R2UB1	Inundated –2- 4”	N/A			
W-107	R2UB1	Inundated – 1-12”	N/A			
W-108	PSS1C	Inundated – 1-4” Saturated Drainage patterns Oxidized root channels	Black Willow Soft Rush Wool Grass Fall Panic Grass Monkey Flower Seed Box Deertongue Witchgrass Rice Cutgrass	*Salix nigra* *Juncus effusus* *Scirpus cyperinus* *Panicum dichotomiflorum* *Mimulus ringens* *Ludwigia alternifolia* *Dichanthelium clandestinum* *Leersia oryzoides*	Hatboro silt loam	SS- 0.8 WQ- 0.8 WL- 0.4
W-109	R2UB1	Inundated –1-4”	N/A			

TABLE III-42 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE TRANSITWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-150	R2UB2		N/A			
	PFO1A	Inundated- 1-3”	Black willow	*Salix nigra*	Urban land	SS- 0.8
		Sediment deposits	Red maple	*Acer rubrum*		WQ- 0.8
		Drainage patterns	Pin oak	*Quercus palustris*		WL- 0.4
		Oxidized root channels	Silky dogwood	*Cornus amomum*		
		Water-stained leaves	Southern arrowwood	*Viburnum dentatum*		
			Sedge	*Carex* sp.		
			Ground ivy	*Glecoma hederacea*		
			Jewelweed	*Impatiens capensis*		
W-151	R2UB1		N/A			
	PEM1C/E	Drift lines	Goldenrod sp.	*Solidago* sp.	Baile silt loam	SS- 0.9
		Sediment deposits	Red Maple	*Acer rubrum*		WQ- 0.8
		Drainage patterns	Rice Cutgrass	*Leersia oryzoides*		WL- 0.3
		Oxidized root channels	Smartweed	*Polygonum* sp.		
		Stream 1-3” flow				
W-152	R2UB1	Inundated – 0-4”	N/A			
	PFO1C/E	Saturated	Red Maple	*Acer rubrum*	Baile silt loam	SS- 0.7
		Sediment deposits	Pin Oak	*Quercus palustris*		WQ- 0.6
		Water-stained leaves	False Nettle	*Boehmeria cylindrica*		WL- 0.2

TABLE III-42 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE TRANSITWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-153	R2UB3		N/A			
	PFO1C/E	Saturated	Red Maple	*Acer rubrum*	Baile silt loam	SS- 0.6
		Drainage patterns	Spicebush	*Lindera benzoin*		WQ- 0.6
		Oxidized root channels	Buttonbush	*Cephalanthus occidentalis*		WL- 0.3
		Water marks	Pin Oak	*Quercus palustris*		
			Panic Grass	*Dichanthelium* sp.		
			Sedge	*Carex* sp.		
W-153	PEM1C/E	Drift lines	Panic Grass	*Dichanthelium* sp.	Baile silt loam	SS- 0.7
		Saturated	Rice Cutgrass	*Leersia oryzoides*		WQ- 0.7
		Oxidized root channels	Asiatic Tearthumb	*Polygonum perfoliatum*		WL- 0.3
		Sediment deposits	Sedge	*Carex* sp.		
		Drainage patterns	Soft Rush	*Juncus effusus*		
		Water marks	Jewelweed	*Impatiens capensis*		
W-154	R4SB1		N/A		Mixed alluvial	
	PSS1E	Saturated at 10”	Black willow	*Salix nigra*	Hatboro silt loam	SS- 0.9
		Drainage patterns	Broad leaved cattail	*Typha latifolia*		WQ- 0.8
			Soft rush	*Juncus effusus*		WL- 0.3
			Water purslane	*Ludwigia palustris*		

TABLE III-42 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE TRANSITWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-155	R2UB1		N/A			
	PEM1F	Inundated – 1-3”	Black Willow	*Salix nigra*	Hatboro silt loam	SS- 0.9
		Drainage patterns	Rice Cutgrass	*Leersia oryzoides*		WQ- 0.9
		Drift lines	White Grass	*Leersia virginica*		WL- 0.2
	PSS1A	Saturated	Jewelweed	*Impatiens capensis*	Hatboro silt loam	SS- 0.7
			Soft Rush	*Juncus effusus*		WQ- 0.8
			Cattail	*Typha latifolia*		WL- 0.5
			Smooth Alder	*Alnus serrulata*		
			Black Willow	*Salix nigra*		
			Red Maple	*Acer rubrum*		
			Buttonbush	*Cephalanthus occidentalis*		
W-156	R3UB1		N/A		Mixed alluvial	
	PEM1C	Inundated – 4”	Black Willow	*Salix nigra*	Hatboro silt loam	SS- 0.9
		Drainage patterns	White Grass	*Leersia virginica*		WQ- 1.0
			Soft Rush	*Juncus effusus*		WL- 0.3
			Rice Cutgrass	*Leersia oryzoides*		
			Sedge sp.	*Carex* sp.		

TABLE III-42 (CONTINUED)
WETLANDS AND WATERS OF THE US WITHIN THE TRANSITWAY ALIGNMENT

Wetland Number	Cowardin System	Hydrologic Indicators	Dominant Vegetation		Soils	Wetland Function *
W-62A	PEM1A	Saturated	Common Reed	*Phragmites australis*	Hatboro silt loam	SS- 0.9
		Depth to water in pit –12”	Arrowleaved Tearthumb	*Polygonum sagittatum*		WQ- 0.9
		Water-stained leaves	Barnyard Grass	*Echinocloa crus-galli*		WL- 0.2
			Rice Cutgrass	*Leersia oryzoides*		
			Soft Rush	*Juncus effusus*		
	PFO1A		Green Ash	*Fraxinus pennsylvanica*	Hatboro silt loam	SS- 0.9
			Red Maple	*Acer rubrum*		WQ- 1.0
			Box Elder	*Acer negundo*		WL- 0.5
			Winterberry	*Ilex verticillata*		
			Arrowwood	*Viburnum dentatum*		
			Stout Woodreed	*Cinna arundinacea*		
			Whitegrass	*Leersia virginica*		
			Skunk Cabbage	*Symplocarpus foetidus*		
W-62	R2UB1	Inundated – >6”	N/A		Mixed alluvial	

Notes:

* *The functional assessment score is a number from 0.0-1.0, which describes a wetland’s relative capacity to perform a function, where 0.0 represents no functional capacity and 1.0 represents optimal functional capacity.*

SBEC -- Shoreline Bank Erosion Control
SS -- Sediment Stabilization
WQ -- Water Quality
UH -- Uniqueness/Heritage
FS -- Fish (Non-tidal Stream)

A perennial tributary of Muddy Branch is located along the south side of the proposed Quince Orchard Park/Sioux Lane Station. The stream is approximately six feet wide with a channel depth ranging between two and four feet. A stormwater management pond has been placed at the headwaters of the stream in an attempt to trap runoff from the adjacent parking lot. The stream is backwatered to the base of the pond as a result of a beaver dam located approximately 160 feet downstream. The habitat complexity of the stream is characterized by a shallow riffle/pool sequence with a combination of low-lying scrub-shrub areas and undercut banks that provide suitable habitat for fish. The dominant vegetation in the riparian buffer consists of sycamore, red maple, multiflora rose, and teasel.

The proposed Decoverly station is located just north of a pond with an emergent wetland fringe, which outlets into a perennial stream. The dominant vegetation in the pond consists primarily of broad-leaf cattail with scattered specimens of black willow and sycamore. The wetland is inundated with one to two feet of water and soils were saturated. Soils in the wetland are mapped as Gaila silt loam, which contains hydric inclusions of Baile silt loam. The stream has been channelized along Great Seneca Highway and riprap has been placed within the channel to stabilize the banks. The habitat complexity of the stream is characterized by a riffle/pool sequence but has been reduced due to the change in substrate and alteration of channel morphology.

The areas proposed for yard/shop facilities include sites near Redland Road, Shady Grove Metro Station, Metropolitan Grove Station and COMSAT Station. Wetlands and waterways were not present within the proposed sites at Redland Road and Shady Grove Metro Station after review of the DNR Wetland Guidance Maps and a field reconnaissance. Sites 1, 2, 3, and 5 of the proposed yard/shop facilities for Shady Grove Station are currently being used as parking lots for the surrounding commercial and industrial complexes. Wetlands and waterways are not present within these proposed sites. However, a palustrine forested and emergent wetland that flows to an intermittent stream was identified within site 4 of the proposed yard/shop facilities. During the site visit, soils in the wetland were saturated in the upper 12 inches. Dominant vegetation in the forested portion of the wetland was black willow, red maple, and black cherry, while the emergent area was dominated by cattail, blue vervain, and soft rush. The wetland connected to an intermittent stream that paralleled the west side of Frederick Road. The channel is approximately three feet wide with a depth of one foot. During the site visit, the stream was not flowing. A narrow strip of trees approximately 25 feet wide on either side of the stream was dominated by silver maple, box elder, and black willow. The principal functions associated with this wetland system ranked high for both sediment stabilization and water quality, while wildlife ranked below average.

Proposed yard/shop facility sites 1-3 at the proposed Metropolitan Grove location have a perennial tributary (R2UB2) to Great Seneca Creek that flows through the site. The stream is approximately six feet wide with a channel depth of three feet. The stream is relatively stable throughout the forested portions of the site; however, disturbance is evident within the power line right-of-way. Most of the vegetation has been removed, while scrub-shrub vegetation remains along the stream, providing little shade and stability to this section of the stream. As the stream flows into the forested portions of the site, habitat complexity is increased as evidenced by a shallow riffle/pool sequence, with deep pools occurring near undercut banks. Erosion is

moderate throughout the stream with minor deposition occurring near the culvert along Game Preserve Road. The forested buffer is composed of ironwood, sycamore, dogwood, tulip poplar, paw paw, and Christmas fern.

The stream flows under the road into site 2A and eventually under the CSX railbed with little change in channel structure and composition. The forested buffer associated with this portion of the stream is composed of the same species described in sites 1-3.

Sites 4 and 5 of the proposed yard/shop facilities in the Metropolitan Grove Station area is situated in uplands with slopes exceeding greater than 15%. Wetlands and waterways were not present within this site.

Sites 1 through 3 proposed for yard/shop facilities within the COMSAT property have an intermittent stream that flows southeast through the sites to join a perennial tributary of Little Seneca Creek. The stream is generated from a stormwater management pond located in site 3. The stream has moderate habitat complexity during the growing season, when water levels are higher. However, a shallow riffle/pool sequence and infrequent flows currently characterize in-stream habitat. A forested riparian buffer is associated with the channel and is dominated by tulip poplar, red maple, spicebush, and white oak.

A seep adjacent to the stream in site 1 is classified as a palustrine forested wetland. During the site visit, soils in the wetland were saturated in the upper 12 inches of the soil profile. The dominant vegetation in this wetland consists of red maple, spicebush, arrowwood, skunk cabbage, and Jack-in-the-pulpit. The intermittent stream joins the mainstem of a tributary to Little Seneca Creek within this site. The perennial tributary is approximately eight feet wide with a channel depth of three feet. Habitat complexity can be characterized by a well-developed riffle/pool sequence with deep pools and undercut banks providing suitable habitat for fish. An extensive forested riparian buffer is associated with the stream, providing bank stability and shade.

Emergent wetland fringes within the stream are common throughout site 1. These wetlands are hydrologically supported by overbank flooding and seasonal base flow. The dominant vegetation in these wetlands consists of skunk cabbage, Jack-in-the-pulpit, false nettle, and arrowwood. The principle functions associated with the entire wetland system for sites 1 through 3 ranked high for sediment stabilization and wildlife, while water-quality ranked intermediate. The rating for fish in non-tidal streams and rivers also ranked high.

Surface Water Hydrology and Drainage Patterns

The Code of Maryland Regulations (COMAR) 26.08.02.07 categorizes Maryland's surface waters by 20 river sub-basins. These sub-basins are further sub-divided into smaller basins, termed segments, for a total of 138 watershed segments. The major sub-basins traversed by the I-270/US 15 Corridor include the Middle Potomac River and the Washington Metropolitan Area sub-basins. The Middle Potomac River sub-basin drains portions of Montgomery and Prince George's counties, and borders on the State of Virginia and the District of Columbia. The Middle Potomac River watershed consists of the lower and upper portions of the Monocacy

River. A portion of the Washington Metropolitan Area sub-basin encompasses sub-watersheds that include Cabin John Creek, sections of the Potomac River and Seneca Creek.

The Middle Potomac River basin drains approximately 609.2 square miles of land. This watershed is developing rapidly and supports a wide range of urban and suburban land uses. Most of the urbanized areas occur in the City of Frederick and in areas near Rockville. There are undeveloped areas (33%), which consist of forests and wetlands, throughout the watershed that serve as buffers to the I-270/US 15 Corridor and to major streams in the Corridor. Most of the land between urbanized areas is less developed and consists of agricultural fields (24%), parklands, and historic properties.

Streams and Water Resources

Sixteen major surface water bodies occur along the I-270/US 15 Corridor (See **Figure III-20)**. Seven of these streams are within Montgomery County and include Gunners Branch, Muddy Branch, Great Seneca Creek, Little Seneca Creek, unnamed tributary to Ten Mile Creek, Wildcat Branch, and Little Bennett Creek. The remaining streams are located within Frederick County and include Bennett Creek, Urbana Branch, Monocacy River, Quarry Branch, Arundel Branch, Rock Creek, Carroll Creek, unnamed tributary of the Monocacy River, Tuscarora Creek, and Muddy Run. The proposed transitway alignment occurs completely within Montgomery County and crosses four of the same streams as the highway alignment. These streams include Muddy Branch, Great Seneca Creek, Gunners Branch, and Little Seneca Creek.

All of the surface waters in the project area are classified by the MDE as Class I-P (water contact recreation, aquatic life, and water supply), Class-III (natural trout), or Class-IV (put-and-take trout). **Table III-43** indicates MDE designated uses for surface waters within the project areas.

In the project area the stream order is related to the width of the streams. The 1st and 2nd order tributaries range in size from 5 to 15 feet wide, while the 3rd order streams average 25 feet in width. The largest streams that cross the project area are 4th order or greater and include the Monocacy River, with a width of 250 feet, and Great Seneca Creek, which is 75 feet wide. Channel depth ranges from 2 inches to 15 feet for these streams, depending upon surrounding land use and geology. A review of USGS maps for Montgomery and Frederick counties indicates that hillside seeps and groundwater discharge areas in combination probably constitute the stream flow in most tributaries with surface water run-off from surrounding upland areas. The majority of the stream channels within Montgomery County are situated in forested stream valleys that have been designated as public parks and historic areas. Streams situated in Frederick County and in the northern portion of the Corridor are surrounded by agricultural land. Most of the tributaries to these larger streams are unvegetated and flow through areas of intense development or agricultural fields.

TABLE III-43
MARYLAND DEPARTMENT OF THE ENVIRONMENT
DESIGNATED USES FOR SURFACE WATERS

Stream	County	Classification
Gunners Branch	Montgomery	Use I
Muddy Branch	Montgomery	Use I
Great Seneca Creek	Montgomery	Use I
Little Seneca Creek	Montgomery	Use IV
Tributaries to Ten Mile Creek	Montgomery	Use I
Wildcat Branch	Montgomery	Use I
Little Bennett Creek	Montgomery/Frederick	Use I
Bennett Creek	Frederick	Use I
Urbana Branch	Frederick	Use I
Monocacy River	Frederick	Use I
Arundel Branch	Frederick	Use I
Rock Creek	Frederick	Use III
Carroll Creek	Frederick	Use III
Unnamed tributary to Monocacy River	Frederick	Use IV
Tuscarora Creek	Frederick	Use III
Muddy Run	Frederick	Use I

Source: *COMAR 26.08.02 Water Quality*

Notes: ***S****treams are listed as they occur within the I-270/US 15 Corridor highway and transitway alignment from Shady Grove Road to its terminus at Biggs Ford Road.*
Class I- water contact, recreation, aquatic life, and water supply
Class III- natural trout waters
Class IV- put and take trout

b. Impacts

Wetlands and Waters of the US are regulated under Section 401 and 404 of the Clean Water Act and under the State of Maryland Nontidal Wetlands Protection Act. Impacts to these resources require a Section 401 Water Quality Certification from MDE and a Joint Federal/State permit for discharge of dredged and fill material into Waters of the US including wetlands.

As shown in **Table III-44, Table III-45,** and **Table III-46** wetland impacts have been identified for the proposed build alternates. Emergent wetlands are the vegetative cover type most impacted by the build options associated with Alternates 3A/B, 4A/B, and 5A/B/C. These emergent areas lack a diversity of vegetative layers that normally increases the functional value of a wetland; however, some are connected to larger wetland systems that provide a diverse and interdependent collection of ecological functions. These systems include Great Seneca Creek, Little Seneca Creek, Monocacy River, Rock Creek, Carroll Creek and Tuscarora Creek. Emergent wetlands occurring at the headwater of a stream or in disturbed portions of the roadway also contribute to the impact numbers under Alternates 3A/B, 4A/B, and 5A/B/C. A portion of

the wetland impacts include forested wetlands associated with the Monocacy River and Little Seneca Creek, which ranked high for the uniqueness/heritage functions due to their proximity within the parks that have significant aesthetic and historical value- Monocacy National Battlefield and Black Hill Regional Park.

TABLE III-44
SUMMARY OF WETLAND IMPACTS ASSOCIATED WITH PROPOSED I-270/US 15 ALTERNATES

Wetland Classification	Alternates					
	No-Build	**Alternate 2[1]**	**Alternates 3A/B**	**Alternates 4A/B**	**Alternates 5A/B**	**Alternate 5C**
PEM (acres)	--	0.5	5.5[2]	5.5[2]	6.0[2]	5.7 [3]
PSS (acres)	--	--	1.6 [4]	1.6 [4]	1.9 [4]	1.6
PFO (acres)	--	--	3.6 [5]	3.6 [5]	3.7 [5]	3.4
Riverine (linear feet)	--	--	14,185[6]	14,185[6]	16,331[6]	13,407

[1] *Park and Ride Lot impacts*
[2] *Includes impacts of 0.6 acre for Transitway (includes stations) and 0.5 acre for Park and Ride Lots*
[3] *Includes impacts of 0.5 acre for Park and Ride Lots*
[4] *Includes impacts of 0.4 acre for Transitway (includes stations)*
[5] *Includes impacts of 0.6 acre for Transitway (includes stations)*
[6] *Includes impacts of 2,940 linear feet for Transitway (includes stations)*

TABLE III-45
SUMMARY OF INDIVIDUAL WETLAND SIZE AND IMPACT ALONG THE HIGHWAY ALIGNMENT

		Alternates 3A/B and 4A/B				Alternates 5A/B				Alternate 5C			
Wetland Number		**Riverine (WUS[1]) (ln. ft.)**	**PEM (sq. t.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**
W-2	Overall Size	624	565			624	565			624	565		
	Impact	184				184				184			
W-3	Overall Size	265	928			265	928			265	928		
	Impact	50				50				50			
W-4E	Overall Size	187				187				187			
	Impact												
W-4W	Overall Size	343	15,134			343	15,134			343	15,134		
	Impact	44				44				44			
W-5	Overall Size	225				225				225			
	Impact	112				112				112			
W-6E	Overall Size	620	2,215			620	2,215			620	2,215		
	Impact	620	2,215			620	2,215			620	2,215		
W-6W	Overall Size	47				47				47			
	Impact	35				45				45			
W–7E	Overall Size	178				178				178			
	Impact	63				63				63			
W-7W	Overall Size	664	31,405			664	31,405			664	31,405		
	Impact												
W-8	Overall Size	511				511				511			
	Impact												
W-9E	Overall Size	416				416				416			
	Impact	76				82				106			
W-9W	Overall Size	468		8,515	61,870	468		8,515	61,870	468		8,515	61,870
	Impact	71		2,800	5,662	77		4,870	6,798	105		8,515	16,217
W-11	Overall Size	403				403				403			
	Impact	117				180				180			

TABLE III-45 (CONTINUED)
SUMMARY OF INDIVIDUAL WETLAND SIZE AND IMPACT ALONG THE HIGHWAY ALIGNMENT

		Alternates 3A/B and 4A/B				Alternates 5A/B				Alternate 5C			
Wetland Number		**Riverine (WUS[1]) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**
W-12E	Overall Size				870				870				870
	Impact												
W-12W	Overall Size	795				795				795			
	Impact	280				313				313			
W-13	Overall Size	78	1,995			78	1,995			78	1,995		
	Impact		300				1,983				1,983		
W-14W	Overall Size	166		5,225		166		5,225		166		5,225	
	Impact	50		1,397		59		1,764		59		1,764	
W-14E	Overall Size	264				264				264			
	Impact	140				160				160			
W-15E	Overall Size	175	20,745			175	20,745			175	20,745		
	Impact		4,296				5,555				5,555		
W-15W	Overall Size	190			8,480	190			8,480	190			8,480
	Impact	25			73	45			98	45			98
W-16	Overall Size		3,180				3,180				3,180		
	Impact		800				1,093				1,093		
W-17	Overall Size		5,895				5,895				5,895		
	Impact												
W-18E	Overall Size	415	2,405			415	2,405			415	2,405		
	Impact	85	1,135			85	1,287			85	1,287		
W-18W	Overall Size	758	345	415	5,515	758	345	415	5,515	758	345	415	5,515
	Impact	346	345	415		581	345	415		581	345	415	
W-19N	Overall Size	132		1,550		132		1,550		132		1,550	
	Impact	23		1,533		23		1,533		23		1,533	
W-19S	Overall Size	123		13,230		123		13,230		123		13,230	
	Impact												

TABLE III-45 (CONTINUED)
SUMMARY OF INDIVIDUAL WETLAND SIZE AND IMPACT ALONG THE HIGHWAY ALIGNMENT

		Alternates 3A/B and 4A/B				Alternates 5A/B				Alternate 5C			
Wetland Number		**Riverine (WUS[1]) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**
W-20E	Overall Size		20,590		6,130		20,590		6,130		20,590		6,130
	Impact		1,072				1,568				1,568		
W-20W	Overall Size	478		44,970		478		44,970		478		44,970	
	Impact	158		7,170		164		11,617		164		11,617	
W-21	Overall Size	301				301				301			
	Impact	144				165				165			
W-22	Overall Size			6,795	1,960			6,795	1,960			6,795	1,960
	Impact		208		1,890		1,357		1,625		1,357		1,625
W-22E	Overall Size	124				124				124			
	Impact	124				124				124			
W-22W	Overall Size	1,335		13,450		1,335		13,450		1,335		13,450	
	Impact	264		2,877		728		5,800		728		5,800	
W-23E	Overall Size		31,760				31,760				31,760		
	Impact		12,196				15,460				15,460		
W-23W	Overall Size		15,725				15,725				15,725		
	Impact		2,447				8,338				8,338		
W-24	Overall Size	266				266				266			
	Impact	123				126				126			
W-25E	Overall Size	1,130	7,775			1,130	7,775			1,130	7,775		
	Impact	335	3,877			430	5,920			430	5,920		
W-25W	Overall Size	393	2,510			393	2,510			393	2,510		
	Impact	215	294			400	894			400	894		
W-26E	Overall Size	225	1,500			225	1,500			225	1,500		
	Impact					225	725			225	725		
W-26W	Overall Size	210				210				210			
	Impact	50				88				88			

TABLE III-45 (CONTINUED)
SUMMARY OF INDIVIDUAL WETLAND SIZE AND IMPACT ALONG THE HIGHWAY ALIGNMENT

		Alternates 3A/B and 4A/B				Alternates 5A/B				Alternate 5C			
Wetland Number		**Riverine (WUS[1]) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**
W-27E	Overall Size	377				380				380			
	Impact	117				380				380			
W-27W	Overall Size	345		16,185		345		16,185		345		16,185	
	Impact	75		4,275		110		5,780		110		5,780	
W-28	Overall Size		1,530				1,530				1,530		
	Impact						488				488		
W-29	Overall Size		805				805				805		
	Impact						80				80		
W-30	Overall Size	86			10,210	86			10,210	86			10,210
	Impact	34			1,792	45			2,955	45			2,955
W-31	Overall Size	180		3,055		180		3,055		180		3,055	
	Impact	20				105				105			
W-32	Overall Size		400				400				400		
	Impact		275				395				395		
W-33	Overall Size	66				66				66			
	Impact												
W-34	Overall Size	926				926				926			
	Impact	170				156				156			
W-A35	Overall Size	207				207				207			
	Impact	60				83				83			
W-C35	Overall Size	55				55				55			
	Impact	55				55				55			
W-D35	Overall Size	175				175				175			
	Impact	124				175				175			
W-E35	Overall Size	8,344	95	7,155		8,344	95	7,155		8,344	95	7,155	
	Impact												

TABLE III-45 (CONTINUED)
SUMMARY OF INDIVIDUAL WETLAND SIZE AND IMPACT ALONG THE HIGHWAY ALIGNMENT

		Alternates 3A/B and 4A/B				Alternates 5A/B				Alternate 5C			
Wetland Number		**Riverine (WUS[1]) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**
W-F35	Overall Size	1,074	8,370			1,074	8,370			1,074	8,370		
	Impact	855	5,875			956	6,655			956	6,655		
W-G35	Overall Size	260				260				260			
	Impact					80				80			
W-H35	Overall Size		600				600				600		
	Impact						600				600		
W-36	Overall Size	86		230		86		230		86		230	
	Impact	80		230		85		230		85		230	
W-38	Overall Size	62				62				62			
	Impact	55				62				62			
W-39	Overall Size		9,335				9,335				9,335		
	Impact		4,830				7,683				7,683		
W-41	Overall Size	167				167				167			
	Impact					30				30			
W-42	Overall Size	16				16				16			
	Impact	8				8				8			
W-43	Overall Size	60				60				60			
	Impact	60				60				60			
W-44	Overall Size	75				75				75			
	Impact	54				60				60			
W-45E	Overall Size	70	1,730			70	1,730			70	1,730		
	Impact	20	495			30	911		420	30	911		420
W-45W	Overall Size	85				85				85			
	Impact	10				24				24			
W-46E	Overall Size	85	880			85	880			85	880		
	Impact	60	880			60	880			60	880		

TABLE III-45 (CONTINUED)
SUMMARY OF INDIVIDUAL WETLAND SIZE AND IMPACT ALONG THE HIGHWAY ALIGNMENT

		Alternates 3A/B and 4A/B				Alternates 5A/B				Alternate 5C			
Wetland Number		**Riverine (WUS[1]) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**
W-A46E	Overall Size		1,015				1,015				1,015		
	Impact		1,015				1,015				1,015		
W-47	Overall Size		2,490		3,300		2,490		3,300		2,490		3,300
	Impact		2,490		1,760		2,490		1,760		2,490		1,760
W-48E	Overall Size		21,800				21,800				21,800		
	Impact		18,795				18,795				18,795		
W-48W	Overall Size	893				893				893			
	Impact	425				425				425			
W-49	Overall Size	3,550	88,235	18,850	138,435	3,550	88,235	18,850	138,435	3,550	88,235	18,850	138,435
	Impact	1,680	30,315	16,505	77,785	1,680	30,315	16,505	77,785	1,680	30,315	16,505	77,785
W-50	Overall Size	441		4,275		441		4,275		441		4,275	
	Impact	416		3,640		416		3,690		416		3,690	
W-51	Overall Size	591			20,290	591			20,290	591			20,290
	Impact	536			1,315	536			1,315	536			1,315
W-52E	Overall Size	106	3,150			106	3,150			106	3,150		
	Impact	90	3,150			90	3,150			90	3,150		
W-52W	Overall Size	80				80				80			
	Impact	75				75				75			
W-53	Overall Size				12,595				12,595				12,595
	Impact				11,700				11,700				11,700
W-54	Overall Size	320			6,405	320			6,405	320			6,405
	Impact	200				200				200			
W-55	Overall Size		6,310				6,310				6,310		
	Impact		6,310				6,310				6,310		
W-56	Overall Size		21,560				21,560				21,560		
	Impact		21,560				21,560				21,560		

TABLE III-45 (CONTINUED)
SUMMARY OF INDIVIDUAL WETLAND SIZE AND IMPACT ALONG THE HIGHWAY ALIGNMENT

		Alternates 3A/B and 4A/B				Alternates 5A/B				Alternate 5C			
Wetland Number		**Riverine (WUS[1]) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**
W-57E	Overall Size			9,805				9,805				9,805	
	Impact			9,750				9,750				9,750	
W-57W	Overall Size	221			110	221			110	221			110
	Impact	184			110	184			110	184			110
W-58E	Overall Size		121,705		30,930		121,705		30,930		121,705		30,930
	Impact		45,710		6,200		45,710		6,200		61,620		8,390
W-58W	Overall Size		1,325				1,325				1,325		
	Impact		1,325				1,325				1,325		
W-59	Overall Size	136				136				136			
	Impact	117				117				136			
W-60E	Overall Size	645	3,155		8,905	645	3,155		8,905	645	3,155		8,905
	Impact	32				32				32			
W-60W	Overall Size	460				460				460			
	Impact	174				174				174			
W-61E	Overall Size	125		1,295		125		1,295		125		1,295	
	Impact	86		1,290		86		1,290		86		1,290	
W-B61W	Overall Size	140				140				140			
	Impact	90				90				80			
W-A61W	Overall Size	600				600				600			
	Impact	600				600				600			
W-62A	Overall Size		11,760		43,015		11,760		43,015		11,760		43,015
	Impact		5,766		14,545		2,785		18,040		2,785		18,040
W-62C	Overall Size		15,400		10,060		15,400		10,060		15,400		10,060
	Impact		9,630		6,960		9,630		6,960		9,630		6,960
W-62E	Overall Size	204				204				204			
	Impact	155				155				155			

TABLE III-45 (CONTINUED)
SUMMARY OF INDIVIDUAL WETLAND SIZE AND IMPACT ALONG THE HIGHWAY ALIGNMENT

		Alternates 3A/B and 4A/B				Alternates 5A/B				Alternate 5C			
Wetland Number		**Riverine (WUS[1]) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**
W-62W	Overall Size	358				358				358			
	Impact	245				245				200			
W-A63E/	Overall Size	812				812				812			
W-B63E	Impact												
W-A63W	Overall Size	768				768				768			
	Impact												
W-B63W/	Overall Size	5,943	3,820		105,730	5,943	3,820		105,730	5,943	3,820		105,730
W-D63W	Impact												
W-C63E	Overall Size	68				68				68			
	Impact												
W-64	Overall Size		7,300				7,300				7,300		
	Impact		4,200				4,200				4,200		
W-65	Overall Size	522		2,324		522		2,324		522		2,324	
	Impact	522		2,324		522		2,324		522		2,324	
W-66	Overall Size	46				46				46			
	Impact	27				27				27			
Total Linear Feet Impact =		11,245				13,391				13,407			
Total Square Feet Impact =			191,806	54,206	129,792		211,717	65,568	135,766		227,627	69,213	147,375
Total Acres Impact =			4.4	1.2	3.0		4.9	1.5	3.1		5.2	1.6	3.4

[1] *Waters of the US*

TABLE III-46
SUMMARY OF INDIVIDUAL WETLAND SIZE AND IMPACT ALONG THE TRANSITWAY ALIGNMENT

		Alternates 3A/B and 4A/B				Alternates 5A/B			
Wetland Number		**Riverine (WUS[1]) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**
W-100	Overall Size	194				194			
	Impact	103				103			
W-101	Overall Size	409	438			409	438		
	Impact	253				253			
W-103	Overall Size			21,300				21,300	
	Impact			15,177				15,177	
W-104	Overall Size	77		625		77		625	
	Impact	60		590		60		590	
W-62A	Overall Size		11,760		43,015		11,760		43,015
	Impact								
W-62	Overall Size		15,400		10,060		15,400		10,060
	Impact								
W-102/105	Overall Size	3,980		5,065	28,820	3,980		5,065	28,820
	Impact	138				138			
W-106/107	Overall Size	1,807				1,807			
	Impact	614				614			
W-108	Overall Size			7,665				7,665	
	Impact			2,863				2,863	
W-109	Overall Size	245				245			
	Impact	100				100			
W-156	Overall Size	739	7,915			739	7,915		
	Impact	739	7,915			739	7,915		
W-155	Overall Size		44,400				44,400		
	Impact		15,440				15,440		
W-154	Overall Size	640		540		640		540	
	Impact								
W-153	Overall Size	400	18,290		35,050	400	18,290		35,050
	Impact	165	665		22,205	165	665		22,205
W-152	Overall Size				11,225				11,225
	Impact				1,778				1,778
W-151	Overall Size	566	3,395			566	3,395		
	Impact	91	686			91	686		
W-150	Overall Size	753			4,250	753			4,250
	Impact	334				334			
W-A63W	Overall Size	768				768			
	Impact	275				275			
First Field Station	Overall Size	775				775			
	Impact	68				68			

TABLE III-46 (CONTINUED)
SUMMARY OF INDIVIDUAL WETLAND SIZE AND IMPACT ALONG THE TRANSITWAY ALIGNMENT

		Alternates 3A/B and 4A/B				Alternates 5A/B			
Wetland Number		**Riverine (WUS[1]) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**	**Riverine (WUS) (ln. ft.)**	**PEM (sq. ft.)**	**PSS (sq. ft.)**	**PFO (sq. ft.)**
Total Linear Feet =		**2,940**				**2,940**			
Total Square Feet =			**24,706**	**18,630**	**23,983**		**24,706**	**18,630**	**23,983**
Total Acres =			**0.6**	**0.4**	**0.6**		**0.6**	**0.4**	**0.6**

[1] *Waters of the U.S.*

Alternate 1

Alternate 1 reflects the No-Build condition and as such is not anticipated to have effects on wetlands or streams.

Alternate 2

The assessment of wetland impacts for Alternate 2 considers the three proposed park and ride lots situated at Liberty Road, Trading Lane and Biggs Ford Road. The impacts are minimal for this alternate, with approximately 0.5 acre of emergent wetland being impacted at the proposed Trading Lane park and ride lot. This impact is based on field verification of MD DNR nontidal wetlands in this area and did not include a routine wetland delineation. A routine wetland delineation will need to be performed and a jurisdictional determination conducted to more accurately determine the amount of impact associated with the park and ride at Trading Lane. Wetlands and waterways were not present within the proposed park and ride lots at Liberty Road and Biggs Ford Road.

Alternates 3A/B and 4A/B

The degree of impact to wetlands within Alternates 3A/B and 4A/B does not differ, as the Master Plan HOV alternate for Alternates 3A/B and the Master Plan General-Purpose alternate for Alternates 4A/B are nearly identical.

Highway Alignment

A majority of the impacts (4.4 acres) associated with Alternates 3 and 4 occur in different types of emergent wetlands that contrast in function and value. A mixture of disturbed roadside wetlands and emergent areas interconnected to larger, more diverse wetland systems are included in this impacted cover type. Emergent wetlands situated within the floodplains of major streams including Great Seneca Creek, Little Seneca Creek, Monocacy River, Rock Creek, Carroll Creek, and Tuscarora Creek provide functions with higher ratings, therefore increasing their overall value. Construction activities occurring in roadside wetlands will not significantly alter the function of these areas because human-induced disturbances already exist in these wetlands.

Wetland hydrology could be undermined in pre-staging construction areas as water is routed away from the site. Undermining groundwater driven wetlands, such as those interconnected to larger wetland systems, decreases the functional capacity of the wetland to provide water to the system, increasing the extent of the impact.

The alternates will impact approximately 3.0 acres of forested wetlands primarily located within the floodplains of major stream systems. Most of the floodplain wetlands are designated stream valley parks that are infrequently disturbed and have been protected from adjacent development or alteration. Removal of woody vegetation to accommodate widening of the existing road will significantly alter the forested wetlands by reducing sediment retention time and ultimately influencing water quality. These wetlands also function as wildlife corridors due to their location in stream valley parks. Altering the dense cover type that currently exists in these wetlands could result in the loss of some wildlife species. In addition, those wetlands within the floodplains of the Monocacy River and Little Seneca Creek hold unique and historical values. Development within the Corridor has reduced these types of environments, increasing the rarity of those still present.

Approximately 1.2 acre of scrub-shrub wetland will be impacted by Alternates 3A/B and 4A/B. The scrub-shrub wetlands occur in drainage ways that are frequently disrupted by the roadway. Impacts are minimal in these areas due to the limited diversity and lack of valuable functions.

Alternates 3A/B and 4A/B will affect approximately 11, 245 linear feet of stream within the corridor. A total of fifty streams will be traversed by the highway alignment and include both tributaries and the mainstems to which they flow. These mainstems include Muddy Branch, Great Seneca Creek, Little Seneca Creek, Wildcat Branch, Little Bennett Creek, Bennett Creek, Monocacy River, Carroll Creek, Rock Creek, and Tuscarora Creek. Refer to the section on water quality for a detailed discussion of stream channel impacts associated with construction measures.

Transitway Alignment

A majority of the wetlands impacted by the transitway alignment include perennial and intermittent streams with adjacent fringe wetlands that occur within roadside drainage ways and ditches. Approximately 2, 940 linear feet of stream will be affected by the transitway alignment. These systems flow to Little Seneca Creek, Great Seneca Creek, Gunners Branch, Muddy Branch, and Watts Branch. Most of the wetland impacts (0.6 acre) are to emergent areas within drainage ways that are frequently disturbed by adjacent roadways. However, these wetland systems provide moderate functional ratings for sediment stabilization and water quality by retaining sediment and other pollutants from road runoff. Forested wetlands will also be impacted (0.6 acre), as the transitway extends through relatively undisturbed landscapes in which wooded lots are the dominant cover type. The scrub-shrub wetlands impacted (0.4 acre) by the transitway alignment occur within major drainage ways that are frequently disturbed.

Due to a recent shift in the transitway alignment to improve the horizontal geometrics between the highway and transitway alignments, additional wetland and waterway impacts are being considered in areas that were not previously delineated. There is no impact to a tributary of

Great Seneca Creek on the west side of I-270. The impact is to Wetland 62A in this location as it is an emergent and forested wetland. Field verification of these areas using DNR Nontidal Wetland Guidance Maps have confirmed the approximate locations of these wetlands and waterways within the alignment, however, these sites have not been flagged or surveyed. Therefore, the impact numbers are an approximation based on both surveyed and non-surveyed wetlands and streams. A wetland delineation should be conducted for those additional wetlands and waterways before finalizing wetland impacts associated with the transitway alignment. Further investigations into avoiding or minimizing the impact to this wetland will need to conducted.

Proposed Transitway Yard/Shop Facilities

Wetlands and waterways impacted by the originally selected options for the transitway yard/shop facilities are identified in **Table III-47**. Impacted wetlands occur at sites 1 through 3 at COMSAT Station. Impacts associated with site 1 effect 1.4 acres of forested wetlands and 2,176 linear feet of the adjacent stream. Construction of yard/shop facilities at site 2 will impact 612 linear feet of stream channel, while site 3 construction will impact 348 linear feet of stream channel. The footprint for site 3 will also span a portion of the pond from which the stream originates, impacting 0.7 acre of open water. Based in part on potential wetland and waterway impacts at proposed COMSAT transit yard/shop facilities, Sites 1 and 3 have been removed from further consideration. Therefore, of the two options currently being assessed at the COMSAT site, only Site 2 would have a waterway impact. More detailed studies of potential yard/shop facilities at all three sites are planned prior to the FEIS. Wetlands and waterways associated with any potential facilities will be assessed in detail, surveyed, and verified by regulatory agencies prior to the FEIS.

TABLE III-47
COMPARISON OF WETLAND, WATERWAY, AND FLOODPLAIN IMPACTS FOR THE TRANSITWAY YARD/SHOP FACILITIES

Wetland/Waterwa Classification[1]	Transitway Yard/Shop Facilities											
	Shady Grove					Metropolitan Grove			COMSAT			
	Site 1	Site 2 [2]	Site 3	Site 4	Site 5	Site 1-3 [2]	Site 2A	Site 4-5	Site 1 [2]	Site 2	Site 3 [2]	Site 4
POW (acres)	--	--	--	--	--	--	--	--	--	--	0.7	--
PFO (acres)	--	--	--	--	--	--	--	--	1.4	--	--	--
Riverine (linear feet)	--	--	--	--	--	--	--	--	2,176	612	348	--
Floodplain	--	--	--	--	--	1.3	--	--	--	--	--	--

[1] *POW = Palustrine Open Water; PFO = Palustrine Forest; Riverine = Stream Channel*

[2] *Sites have been eliminated from further consideration.*

Alternate 5A/B/C

The overall impacts to wetlands associated with Alternates 5A and 5B are slightly higher than Alternate 5C. Alternates 5A and 5B include a transitway alignment, while Alternate 5C considers a premium express busway that will use the direct access HOV lanes along the highway alignment.

Highway Alignment

Alternate 5C will have a greater effect on streams in the corridor with 13, 407 linear feet of impact, compared to 13, 391 linear feet impacted by Alternates 5A and 5B. The increase in impact stems from the inclusion of direct access ramps at I-370, MD 118, and MD 85/Shockley Drive under Alternate 5C. Emergent wetlands will receive the greatest amount of disturbance followed by forested and then scrub-shrub cover types. The highway alignment of Alternates 5A/B/C traverses most of the same wetland and stream systems as it does for Alternates 3A/B and 4A/B, with the only difference being that more of the system is impacted under Alternate 5A/B/C from the inclusion of both an HOV and general-purpose lane in each direction along I-270 between MD 121 and I-70.

Transitway Alignment

The proposed transitway alignment included in Alternates 5A and 5B is the same as that proposed under Alternates 3A/B and 4A/B. Therefore, the proposed transitway alignment under Alternates 5A and 5B will have the same potential impact to wetlands and waterways.

Proposed Transitway Yard/Shop Facilities

The proposed transitway yard/shop facilities are the same as those proposed for Alternates 3A/B and 4A/B. Therefore, the potential impacts to wetlands and waterways are also the same as proposed for Alternates 3A/B and 4A/B.

c. Avoidance and Minimization

Complete avoidance of impacts to surface waters and wetlands is not possible due to the quantity of these systems in the project area and their orientation perpendicular to the proposed alternates and transitway alignment. However, impacts have been avoided or minimized wherever possible through the initial placement of alignments to avoid unnecessary crossings. Investigations of further avoidance and minimization measures are on going and will continue throughout all phases of the planning process and engineering design for the project. Additional measures currently being assessed include alignment shifts, elimination of proposed interchanges, and relocation of roads based on resource agency coordination.

During final design, bridges and culverts will be designed to maintain the geomorphic stability of the stream channels as bankfull and flood-prone elevations are evaluated. Consideration will be given to the full range of crossing options including bridging and culvert designs such as bottomless arch and depressed culverts that allow for the maintenance of a natural stream

bottom, reduce the risk of creating barriers to fish movement, and maintain corridors for wildlife passage.

Short-term construction impacts will be minimized through strict adherence to SHA erosion and sediment control procedures and MDE stormwater management regulations. These procedures include the use of BMPs and structural controls such as the minimization of exposed soils through vegetative cover, use of contouring and diversion to reduce water velocities, routing of runoff to retention basins and installation of control structures such as sediment fences. For Class I surface waters, in-stream work may not be conducted during the period March 1 through June 15, inclusive, during any year, while Class III waters have a restriction for in-stream construction between October 1 through April 30. Surface waters designated as Class IV have an in-stream restriction during the period March 1 through May 31. Long-term impacts to water quality will be minimized to the extent possible through the use of an SHA and Maryland Transit Administration (MTA) approved stormwater management plan. Stormwater management plans will be in compliance with MDE requirements and will be designed to treat both quantity and quality of stormwater runoff prior to discharge into receiving waters.

d. Mitigation

Mitigation planning for unavoidable wetland impacts of the I-270/US 15 Multi-Modal Corridor project has followed the guidelines of the Maryland Compensatory Mitigation Guidance (1994). Mitigation requirements under Section 404 are typically determined based on some ratio of wetland acres replaced to wetland acres lost. The exact ratio is decided by the regulatory agencies, but general ratios for palustrine emergent wetlands is 1:1 and for palustrine forested and palustrine scrub/shrub wetlands is 2:1. Identification of compensatory wetland mitigation sites has also taken into consideration the goal of replacing functions and values lost by the potentially impacted wetlands.

The purpose of this investigation was to identify suitable wetland mitigation sites that can provide SHA and MTA with compensatory mitigation for wetlands expected to be impacted by the I-270/US 15 Multi-Modal Corridor project. Preliminary review indicated that SHA would need to mitigate for wetland impacts within portions of four watersheds in the Washington Metropolitan Area sub-basin (MDE 02-14-02) and the Middle Potomac sub-basin (MDE 02-14-03), including the Seneca Creek Watershed (MDE 02140208), the Potomac River Montgomery County area drainage (MDE 02140202), the Lower Monocacy Watershed (MDE 02140302) and the Upper Monocacy Watershed (MDE 02140303). The goal of this site search was to identify at least 90 acres of potential wetland mitigation based upon a 2:1 mitigation ratio. Initial estimates indicated approximately 45 acres of wetland impacts, but the actual amount of impacts were reduced through avoidance and minimization efforts. **Table III-48** and **Table III-49** represent the updated number of wetland impacts and subsequent mitigation estimates based on the project alternates and potential transitway yard/shop facility sites, respectively.

TABLE III-48
WETLAND (ACRES) AND WATERWAY (LINEAR FEET) IMPACTS AND MITIGATION ESTIMATES FOR EACH I-270/US 15 ALTERNATE

Project Alternates	Palustrine Emergent (1:1)	Palustrine Scrub/Shrub (2:1)	Palustrine Forested (2:1)	Linear Feet of Riverine (1:1)	Wetland Totals (Acres)
Alternate 1	NA	NA	NA	NA	NA
Mitigation Estimate	NA	NA	NA	NA	NA
Alternate 2	0.5	--	--	--	0.5
Mitigation Estimate	0.5	--	--	--	0.5
Alternate 3A/B	5.5	1.6	3.6	14,185	10.7
Mitigation Estimate	5.5	3.2	7.2	14,185	15.9
Alternate 4A/B	5.5	1.6	3.6	14,185	10.7
Mitigation Estimate	5.5	3.2	7.2	14,185	15.9
Alternate 5A/B	6.0	1.9	3.7	16,331	11.6
Mitigation Estimate	6.0	3.8	7.4	16,331	17.2
Alternate 5C	5.7	1.6	3.4	13,407	10.7
Mitigation Estimate	5.7	3.2	6.8	13,407	15.7

NA Not Applicable

The wetland mitigation site search utilized a Geographic Information System (GIS) for the preliminary identification of potential mitigation areas. The criteria used for the identification of potential sites were: located on non-forested or open areas at least five acres in size, contained hydric soils or soils with hydric inclusions, and located topographically on slopes less than 3 percent. These potential areas were verified in the field during windshield surveys and accepted or rejected depending on the criteria above. Acceptable sites were documented with information on hydrologic conditions, vegetation, existing wetlands, bank and floodplain characteristics, current land use, constraint issues, and any potential stream restoration associated with the site. Potential stream restoration was included only for the main stem tributary associated with each site.

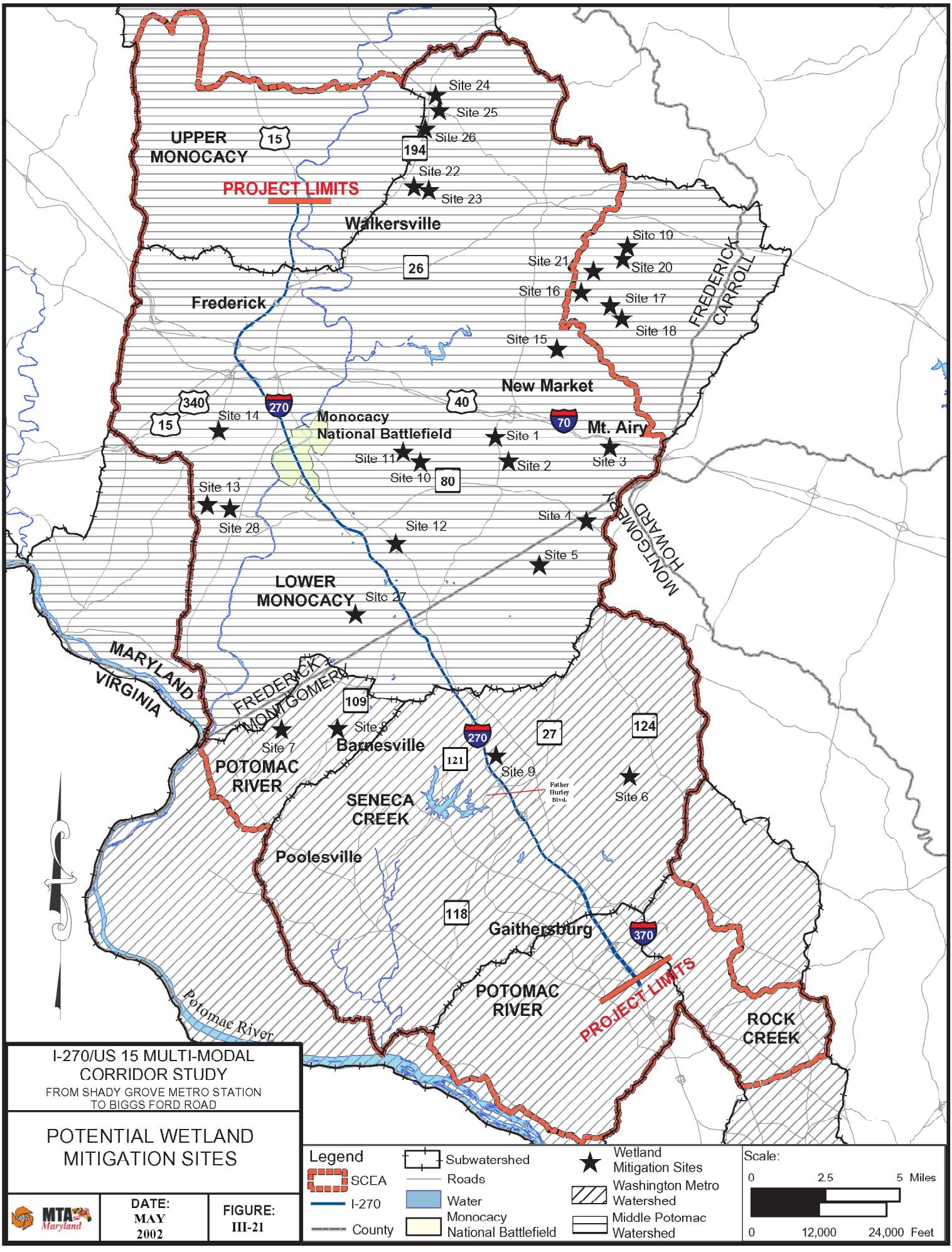
TABLE III-49
WETLAND (ACRES) AND WATERWAY (LINEAR FEET) IMPACTS AND MITIGATION ESTIMATES FOR POTENTIAL TRANSITWAY YARD/SHOP FACILITIES

COMSAT Yard/Shop Facility Sites	Palustrine Open Water (1:1)	Palustrine Forested (2:1)	Linear Feet of Riverine (1:1)	Wetland Totals (Acres)
Site 1	0	1.4	2,176	1.4
Mitigation Estimate	0	2.8	2,176	2.8
Site 2	0	0	612	0
Mitigation Estimate	0	0	612	0
Site 3	0.7	0	348	0.7
Mitigation Estimate	0.7	0	348	0.7
Site 4	0	0	0	0
Mitigation Estimate	0	0	0	0

The windshield surveys produced 27 potential mitigation sites. All property owners were notified by SHA and given a 30-day period for response. During the notification period another potential mitigation site was added to the list as a result of an interested property owner, which increased the number of potential sites to 28, see **Figure III-21**. The initial on-site evaluations were conducted on 24 of the 28 sites to verify existing information and gather additional data on vegetation, soils and hydrologic features associated with each site. On-site evaluations were not performed on four potential sites due to access issues associated with the properties.

The 28 potential mitigation sites were ranked based on soils, hydrology, slope, habitat value, type of mitigation, constraint issues, and the amount of earthwork required to develop the site. The 28 sites identified and described in the Wetland Mitigation Site Search Report (April 2001) represent approximately 621 acres of potential wetland mitigation and 79,000 linear feet of stream restoration. The top nine sites with the highest rank were recommended as high-priority sites and represent over 200 acres of potential mitigation and 27,000 linear feet of stream restoration. A 200-acre minimum mitigation acreage was established for the project to provide approximately two times the amount of acreage required of the site search (90 acres). This allows for sites to be eliminated by the resource agencies or any other constraint issues. The nine sites are described in detail in the Wetland Mitigation Site Search Report (April 2001), and correspond to the best sites suggested for compensatory mitigation requirements associated with the I-270/US 15 Multi-Modal Corridor project. In addition, potential stream restoration was estimated for the main stem tributary associated with each site identified and is noted in the site descriptions.

Field reviews of the potential wetland mitigation sites were held on-site on April 25 and 26 and May 2 and 3, 2001. Individuals from the EPA, USACOE, MDE, DNR and SHA were in attendance at different times throughout the four days of review.



I-270/US 15 MULTI-MODAL CORRIDOR STUDY

FROM SHADY GROVE METRO STATION TO BIGGS FORD ROAD

POTENTIAL WETLAND MITIGATION SITES

MTA Maryland

DATE: MAY 2002

FIGURE: III-21

Legend

- SCEA
- I-270
- County
- Subwatershed
- Roads
- Water
- Monocacy National Battlefield
- Wetland Mitigation Sites
- Washington Metro Watershed
- Middle Potomac Watershed

Scale:

0 2.5 5 Miles

0 12,000 24,000 Feet

Three of the sites previously recommended as high-priority sites were dropped down on the priority list because of agency comments during the field evaluations. Additional sites were added to the agency field reviews to ensure an appropriate amount of mitigation for anticipated wetland and waterway impacts. Site 9 was not evaluated during agency field reviews because the site had already been accepted by the agencies and is under negotiation by SHA. Sites 1, 2, 3, 4, 6, 7, 10, 24 and 27 were not evaluated during the agency field reviews because the sites did not represent the best sites for wetland mitigation. Site 17 was not evaluated during the agency field reviews because access to the site was not granted by one of the property owners.

A total of thirteen sites were evaluated with the resource agencies and are described below. **Table III-50** represents a summary of the high-priority mitigation sites and an estimate of mitigation credits based on information obtained during the agency field reviews. Following the agency field reviews, the environmental review agencies suggested that the mitigation approach target the North Fork and South Fork watersheds of Linganore Creek, which includes sites 16 through 21. The agencies recommended preferential use of these sites and concurred that these sites would be instrumental in providing wetland restoration, creation and enhancement, as well as providing stream restoration and expanding greenways. Emphasis will be placed on this watershed approach for sites 16 through 21, but will not preclude the other high-priority mitigation sites identified and discussed in this section. An assessment of potential archeological resources was completed for each of the wetland mitigation sites (refer to **Table III-31**). In addition, coordination with the State Historic Preservation Office has been initiated for the mitigation sites to determine the effects on any potential historic or cultural resources. The following information was compiled as a summary of comments and conversations during the four days of site reviews and submitted to all attendees for their confirmation.

TABLE III-50
SUMMARY OF POTENTIAL WETLAND AND STREAM MITIGATION SITES

Priority#	Site#	Estimate of Wetland Mitigation Credits (Acres)	Estimate of Potential Stream Restoration (Linear Feet)
1	5	20.0	2,600
2	19/20[1]	12.6+	10,000+
3	18[1]	14.4	1,400
4	25	10.3	1,500
5	21[1]	10.6	2,500
6	11	16.9	3,200
Totals		**94.1+**	**29,600+**

[1] *Agency preferred sites.*

Site 5

This site is located on the east and west sides of Bethesda Church Road just north of the intersection with Clarksburg Road in Montgomery County. The site is associated with the floodplain of Bennett Creek and is located in the Upper Bennett Creek drainage (021403020225) of the Lower Monocacy subwatershed (02140302). This site borders the National Register Eligible Browningsville Historic District. The property owner would like to create a pond with commercial fishery ("channel catfish"). Site 5 is associated with the regional sole source aquifer.

This site was approved by the agencies. Comments included extending the riparian planting into the north end of site to create upland forest transitioning into forested wetlands for greater canopy coverage.

Site 8

This site is located on the west side of Old Hundred Road (Rt. 109) at an unnamed tributary to Little Monocacy River, just north of the Barnesville Township in Montgomery County. The site is associated with the floodplain of the unnamed tributary and is located in the Little Monocacy River drainage (021402020853) of the Potomac River Montgomery County area subwatershed (02140202). This unnamed tributary to the Little Monocacy River is associated with the regional sole source aquifer. Site 8 could provide an opportunity to create wetlands and expand the woody vegetated buffer that currently exists along the stream. Stream restoration associated with the site would primarily involve riparian plantings. The reforestation of the riparian area will create an additional benefit by providing greenway connections. The agencies concurred with the use of this site for riparian planting and wetland creation. Comments included a recommendation to investigate the depth to groundwater and other hydrologic sources for the wetland creation component. Preliminary estimates for creation potential at this site have not been determined.

Site 11

This site is located on the north side of Price Distillery Road just east of Ijamsville Road in Frederick County. The site is associated with the floodplain of Bush Creek and is located in the Lower Bush Creek drainage (021403020229) of the Lower Monocacy subwatershed (02140302). This site provides an opportunity for enhancement of prior converted wetlands and wetland creation. Depth to groundwater will be determined with monitoring wells and a water budget will be developed. Agencies concurred with the use of this site. Comments included: hydrology for the wetlands should be "off-line" from Bush Creek; an upland forest buffer transitioning to the created forested wetlands should be considered; and riparian stabilization plantings would be beneficial along portions of Bush Creek.

Site 13

This site is located east of New Design Road, west of the B & O Railroad, north of Manor Woods Road and just south of Keller Lime Plant Road (abandoned) in Frederick County. The site is associated with an unnamed tributary to Horsehead Run and is located in the Horsehead Run and Rocky Fountain Run drainage (021403020227) of the Lower Monocacy subwatershed (02140302). Site 13 is associated with an unnamed tributary to Horsehead Run that flows into the western portion of site 28. This deep and narrow, spring-fed tributary begins just upstream of the site across New Design Road. Portions of this tributary to Horsehead Run are dominated by submerged aquatic vegetation (SAV). The original mitigation approach was to restore a more natural dimension and pattern to this apparently straightened and deepened reach, which would provide approximately 2,500linear feet of stream restoration. This site was not recommended by the agencies for wetland creation or for stream restoration due to the prevalence of SAV's in the

stream. Disturbance or even riparian plantings may shade the SAV's and diminish their water quality benefits.

Site 14

This site is located on the east and west sides of Ballenger Creek Pike (Rt. 351) just northeast of Elmer Derr Road in Frederick County. The site is associated with the floodplain of Ballenger Creek and is located in the Ballenger Creek drainage (021403020230) of the Lower Monocacy subwatershed (02140302). Site 14 is considered mainly for potential stream enhancements, since Ballenger Creek is considered natural trout waters (Use III Waters). Sparse woody vegetation along this reach does not currently provide adequate shading or bank protection to promote trout reproduction. However, the channel has a good substrate of gravel and cobble. Approximately 2,000 linear feet of stream in the eastern portion of the site has potential for stream restoration, primarily riparian plantings and buffer enhancements. The portion of the site west of Ballenger Creek Pike is a proposed reforestation area for an adjacent housing development. Agencies did not find this site suitable for wetland creation efforts, but recommended riparian enhancements, which would improve water quality and benefit trout reproduction.

Site 16

This site is located on the north side of Glissans Mill Road, where it intersects with Kimmel Road in Frederick County. The site is associated with the floodplain of the South Fork of Linganore Creek and is located in the South Fork and Woodville Branch drainage (021403020235) of the Lower Monocacy subwatershed (02140302). The proposed mitigation for this site would include forested wetland creation, riparian plantings and cattle exclusion. The site may require excavation up to three to four feet on the western portion of the site. Completion of a water budget and installation of monitoring wells is recommended for this area. The potential for stream restoration is evident, however, riparian plantings and livestock exclusion would be contrary to the operation of business (dairy farm) for the property owner. The agencies thought this site had marginal wetland creation potential. It was recommended that the site be used only for riparian area enhancements.

Site 18

This site is located on the north and south sides of Glissans Mill Road, east of Harrisville Road and west of Wilson Road in Frederick County. The site is associated with the floodplain of the South Fork of Linganore Creek and is located in the South Fork and Woodville Branch drainage (021403020235) of the Lower Monocacy subwatershed (02140302). The mitigation concept for this property would include wetland creation, enhancement and preservation along with stream restoration. Potential stream restoration could include livestock exclusion, bank stabilization and riparian plantings. Riparian plantings would be concentrated in the western and northeastern areas. Existing forested wetlands would be preserved and the existing emergent and prior converted wetlands would be enhanced by the establishment of woody vegetation. Wetland creation would be confined to the southwest area of the site and on areas adjacent to the creek (north side of Glissans Mill Road). Hydrologic/hydraulic and water budget studies will need to be conducted for the site. Agencies recommended preferential use of this site and suggested that

the sediment input from steep slopes (near the house) be addressed in development of the mitigation plan.

Site 19/20

This site is located on the west side of Emerson Burrier Road and Woodville Road and south of Liberty Road (MD 26) in Frederick County. The site is associated with the floodplains of Talbot Branch, North Fork of Linganore Creek and an unnamed tributary of the North Fork which are located in the North Fork and Talbot Branch drainage (021403020238) of the Lower Monocacy subwatershed (02140302). These properties consist of three parcels owned by members of the same family. Portions of these properties were included in both sites 19 and 20. They are being considered primarily for stream restoration and wetland creation where feasible. These large properties would serve to expand and connect the discontinuous greenways in this predominantly agricultural area. The western portion of site 20 has potential for wetland creation. A ditch/swale present on the south side of Talbot Branch would provide additional hydrology. Stream restoration associated with this site could include riparian plantings, willow staking, livestock exclusion, and streambank alterations in some areas. The west side of site 19 has some stream restoration potential, which could include riparian enhancements, livestock exclusion and possibly some in-stream work. There may be potential to create some pocket wetlands along portions of this area. The agencies suggested investigating wetland creation potential with monitoring wells. The valley to the west of site 19 (Parcel 27) contains a straightened stream reach with some adjacent emergent wetlands. This area has stream restoration opportunities including riparian plantings for reducing thermal impacts and promoting trout reproduction. There may be the potential to create additional wetland pockets; however, this would require additional investigation of the water budget. The agencies recommended preferential use of these sites and concurred that these sites would be instrumental in connecting and expanding greenways especially in conjunction with other adjacent mitigation sites. This site would provide stream restoration and wetland restoration/creation opportunities. They recommend investigating any records at the local soil conservation district to determine if drainage tiles were installed on the site. Coordination with the State Historic Preservation Office is currently being conducted on this site to determine the effects on any potential historic or cultural resources.

Site 21

This site is located on the northeast and southwest sides of Dollyhyde Road, east of Mapleville Road and west of Emerson Burrier Road in Frederick County. The site is associated with the floodplain of the North Fork of Linganore Creek and is located in the North Fork and Talbot Branch drainage (021403020238) of the Lower Monocacy subwatershed (02140302). The western portion of the site is being excluded from site review due to property owner disinterest. The eastern portion is being considered for the restoration and enhancement of wetlands, and stream restoration in the form of riparian plantings, livestock exclusion and bank stabilization. The property owner of the eastern portion of the site met the reviewers on-site and presented a list of objectives that he developed for his property. The property owner provided some information of the property including: a spring entering from the east side (between Dollyhyde Road and the knoll - near owner's house location) that was ditched by a previous farmer and appears to be feeding an area mapped as prior converted wetlands; seeps east of the knoll, and a

field on the northwest portion of the property (west of the creek) that he would like to keep for hay production. One of the property owner's objectives is to construct a pond. Agencies comments included concerns about increased water temperatures from the pond outfall, preference for an "off-line" system, and the need for plantings around the pond for shading/cooling. The agencies recommended preferential use of this site with the following comments: perform hydrologic/hydraulic studies on stream and floodplain; northeastern end of site appears to be higher and drier than the rest and may not be as suitable for wetland creation; riparian plantings would be beneficial on-site; groundwater monitoring wells should be installed to investigate water budget; a mosaic of forested and emergent wetland creation is recommended; and, some of the very wet areas may not support forested wetlands. There was also a recommendation for an investigation of Bog Turtle habitat in the wet meadow.

Site 22

This site is located on the south side of Daysville Road just west of Hoffman Seachrist Road and east of Water Street in Frederick County. The site is associated with the floodplain of Cabbage Run and Israel Creek, and is located in the Lower Israel Creek and Cabbage Run drainage (021403020237) of the Lower Monocacy subwatershed (02140302). Considered mainly for its 2,000 linear feet of potential stream restoration, this site was rejected by the agencies primarily due to issues associated with Lehigh's mining operation upstream of the site.

Site 23

This site is located on the north side of Daysville Road just west of Hoffman Seachrist Road in Frederick County. The site is associated with the floodplain of Cabbage Run and is located in the Lower Israel Creek and Cabbage Run drainage (021403020237) of the Lower Monocacy subwatershed (02140302). Portions of this site are within Lehigh mining company property. These three properties could provide approximately 4,000 linear feet of stream restoration opportunities. This and adjacent properties that make up site 23 would be negatively affected by mining operations, which would be contrary to mitigation efforts at this site. Agencies did not concur with the use of this site due to issues associated with Lehigh's mining operation.

Site 25

This site is located on the south side of Woodsboro Road (MD 550), east of Woodsboro Pike (MD 194) and west of Hoffman Seachrist Road in Frederick County. The site is associated with the floodplain of Israel Creek and is located in the Lower Israel Creek and Cabbage Run drainage (021403020237) of the Lower Monocacy subwatershed (02140302). The proposal for this site is to create wetlands on the east side of Israel Creek, enhance the existing wetlands, and restore stable banks to a portion of the creek. The existing prior converted wetlands are inundated with 1-6 inches of standing water and are vegetated primarily by non-native species. Soil borings revealed a fragipan at a depth of two feet in the area between prior converted wetlands and Israel Creek. Stream restoration would include livestock exclusion, bank stabilization, and riparian plantings that would improve water quality and aquatic habitat. DNR may have historically stocked this stream because the property owner has observed trout and sunfish in past years. The agencies concurred with the use of this site with the following comments: investigate the water

budget with monitoring wells, the work proposed in the existing wetlands may be considered preservation with some enhancement by planting native herbaceous plants, and gradually grade areas transitioning from emergent to forested wetlands. There may be wetland potential on the west side of Israel Creek by using the hydrology from a drainage ditch/stream located on the west side of Israel Creek paralleling the south side of Woodsboro Road. A jurisdictional determination will need to be conducted by NRCS.

Site 28

This site is located west of Buckeystown Pike (MD 85), north of Manor Woods Road, east of the B & O Railroad and south of Keller Lime Plant Road in Frederick County. The site is associated with the floodplain of Horsehead Run and an unnamed tributary flowing into the site from the west. The site is located in the Horsehead Run and Rocky Fountain Run drainage (021403020227) of the Lower Monocacy subwatershed (02140302). The original mitigation approach was to enhance the existing emergent wetlands and transition to forested wetlands where possible. However, the site may be too wet for forested wetlands and emergent wetlands are more extensive than mapped. The western area of the site (near railroad tracks) is inadequate for wetland creation. However, there is the possibility for some riparian enhancement opportunities along the unnamed tributary to Horsehead Run. Potential stream restoration along the unnamed tributary to Horsehead Run, between areas mapped as emergent wetlands, could include riparian plantings and livestock exclusion. The agencies agree with the use of this site at least for preservation.

2. Wetlands of Special State Concern

a. <u>Existing Conditions</u>

Nontidal Wetlands of Special State Concern (NTWSSC) have been specially designated by the State of Maryland as deserving of special protections due to their ecological significance. The Wildlife and Heritage Division of DNR indicates that a NTWSSC, known as the Germantown Bog, is situated 400 feet upstream of Wetland 57E. Wetland 57E extends 100 feet east of the I-270/Father Hurley Boulevard interchange and continues outside of the project area along a tributary to Little Seneca Creek. These areas are most likely connected hydrologically as the tributary spans the distance between the two wetlands. The records from the DNR database indicate that there are state threatened plant species within the Germantown Bog. These species include Canadian burnet (Sanguisorba canadensis), swamp-oats (Spenopholis pensylvanica), and Buxbaum's sedge (Carex buxbaumii). An RTE survey was conducted within Wetland 57E and surrounding areas even though the succession of threatened plant species is unlikely due to the wetland's frequent disruption by roadway maintenance. However, the hydrologic connection between Wetland 57E and the Germantown Bog warranted a survey to confirm their absence or presence within this area. There were no RTEs found within Wetland 57E and the surrounding area.

b. Impacts

Non-tidal Wetlands of Special State Concern have been designated by the State of Maryland as deserving of special protections due to their ecological significance. The Highway alignment of Alternates 3A/B, 4A/B, and 5A/B/C will not directly impact the Germantown Bog due to its location approximately 400 feet east of the proposed right-of-way for each alternate. While impacts will occur to Wetland 57E through the addition of highway lanes, the Germantown Bog lies upstream of Wetland 57. Because the NTWSSC lies upstream of the impacted wetland, no indirect effects to the NTWSSC are anticipated as well. The Transitway alignment lies west of I-270; therefore, no impacts to the Germantown Bog are anticipated from this transit alignment.

c. Mitigation

Because of their designated status, impacts to NTWSSC will require additional coordination with MDE and the DNR Wildlife and Heritage Division. Maryland State Highway Administration (SHA) will work with the agencies to determine the extent of the impact and assess whether the impacts would diminish the ecological significance of the wetland. Alternate selection and avoidance and minimization efforts will be coordinated with agency personnel to find the alternate that best balances natural resource and other impacts with project purpose and need.

3. Surface Water Quality

a. Existing Conditions

Sections 401 and 402 of the Clean Water Act attempt to reduce some of the negative effects of development on water resources by mandating that state and federal water quality standards be met for activities that result in the discharge of materials to "Waters of the United States." Section 401 requires a Water Quality Certificate for discharge of dredged or fill material, while Section 402 dictates that a National Pollution Discharge Elimination System (NPDES) permit be obtained for any point discharges such as a stormwater management pond.

The surface water quality standards established by MDE are based on the designated uses of surface waters and the water quality criteria that pertain to each of these designations. Both state and county organizations were contacted regarding ambient water quality data for surface waters identified within the I-270/US 15 Corridor in Montgomery and Frederick counties. Both the Maryland Biological Stream Survey (MBSS) of the DNR and MDE assess the ecological health of the State's nontidal streams by conducting biological and chemical sampling within 1st, 2nd and 3rd order streams in Maryland. At a local level, the Department of Environmental Protection for Montgomery County has established a Countywide Stream Protection Strategy (CSPS) (1999) that incorporates biological and habitat sampling of Montgomery County streams in order to identify and prioritize subwatershed areas in need of attention.

The streams within the I-270/US 15 Corridor that are designated by MDE as Class I streams are Gunners Branch, Muddy Branch, Great Seneca Creek, Little Bennett Creek, Bennett Creek, Urbana Branch, Monocacy River and an unnamed tributary, Quarry Branch, Arundel Branch, and Muddy Run. Available data for pH, temperature, and dissolved oxygen levels taken from MBSS

sampling stations over a three year period (1995-1997) for Gunners Branch, Muddy Branch, Great Seneca Creek, Little Bennett Creek, and Bennett Creek, comply with the state water quality standards stated in COMAR regulations 26.08.02.01. The pH levels ranged from 6.76 to 8.76, while water temperatures ranged from 13 to 22.3oC. Dissolved oxygen levels ranged from 5.8 to 10.5 mg/l. **Table III-51** indicates water quality criteria for designated uses.

High nutrient levels (nitrate, total nitrogen, orthophosphate, total phosphorus) and elevated fecal coliform and pH levels were observed at water quality monitoring stations on the lower portions of Seneca Creek and portions of the Monocacy River just downstream of Frederick. State standards for fecal coliform levels relate to large numbers of samples taken over a short period of time, with a public health hazard being assumed if the fecal coliform density exceeds the log mean of 200 most probable number (mpn) per 100 milliliter (ml), based on a minimum of five samples taken over a 30-day period, or if 10% of the total number of samples in one month exceed 400 mpn per 100 ml. Samples were only taken once per month from the Monocacy station between 1993 and 1997; however, of the 54 samples in the data set, the 200 mpn per 100 ml level was exceeded 34 times. Levels ranged from 7.8 to 40,000 mpn per 100 ml. High bacteria and nutrient levels are probably due to agricultural and urban runoff, municipal discharges, and upstream sources.

TABLE III-51
WATER QUALITY CRITERIA SPECIFIC TO DESIGNATED USES

Designated Use	Constituents				
	Dissolved Oxygen (mg/l)	Fecal coliform (mpn/100ml)	pH	Turbidity (FTU)	Temperature (°C)
Class I	>5	Exceeds log mean of 200 per 100 ml, based on a minimum of not less than five samples taken over a 30-day period.	>6.5	>150	<32
Class II	>5	<14	>6.5	>150	<32
Class III	>5 at any time, with a minimum daily average of <6.	Exceeds log mean of 200 per 100 ml, based on a minimum of not less than five samples taken over a 30-day period.	>6.5	>150	<20
Class IV	>5	Exceeds log mean of 200 per 100 ml, based on a minimum of not less than five samples taken over a 30-day period.	>6.5	>150	<23.9

Source: *COMAR 26.08.02 Water Quality*

The streams designated as Class III-P that are situated in Frederick County within the northern portion of the I-270/US 15 Corridor are Wildcat Branch, Rock Creek, Carroll Creek, tributaries to Ballenger Creek, and Tuscarora Creek. This designation includes waters that have the potential for or are suitable for the growth and propagation of trout and are capable of supporting trout populations and their associated food organisms, as well as supplying water for public use. Data collected from sampling stations on a tributary to Carroll Creek and the mainstem of Tuscarora Creek, west of the I-270/US 15 Corridor, exhibited dissolved oxygen levels well above

the state standard (5mg/l) for Class III streams. Dissolved oxygen levels ranged from 9.5 to 11.5mg/l. The state standard for temperature in Class III streams may not exceed 68°F (20°C) or the ambient temperature of the surface waters, whichever is greater. Water temperatures at the Tuscarora Creek sampling stations were at a maximum for the state standard at 69°F (20.5°C), while temperatures for the tributary to Carroll Creek were 52.7°F (11.5°C).

Little Seneca Creek is the only stream within the I-270/US 15 Corridor highway and transitway alignments designated by MDE as a Class IV-P stream. Class IV-P streams are considered recreational trout waters, which have an adult trout "put-and-take" population and may be used for public water supplies. State standards for Class IV-P are comparative to those of Class I for dissolved oxygen and pH, with the only difference being temperature. The maximum temperature in accordance with COMAR 26.08.03.03-0.5 may not exceed 75°F (23.9°C) or the ambient temperature of the surface waters, whichever is greater. Data collected from two sampling stations just up and downstream of the I-270 roadway exhibited pH, temperature and dissolved oxygen levels that are in compliance with state standards.

b. Impacts

Direct impacts to streams are regulated at the federal level under Section 404 of the Clean Water Act and by the State of Maryland through its wetlands and waterways regulations. Impacts to these resources would require a Joint Section 404 Wetland permit as well as Section 401 Water Quality Certification from MDE.

Long-term impacts to surface waters are not anticipated if Best Management Practices (BMP) for both stormwater and sediment control are implemented. Long-term effects can permanently alter hydrology and biological structure of in-stream habitat. Short-term effects usually occur during the construction phases of the build alternates, where impacts to surface water resources are temporary. Temporary impacts include grading or the removal and manipulation of vegetation.

All of the build alternates for both highway and transitway options will require new or extended stream crossings and therefore have the potential to directly impact surface waters during construction. These streams include Muddy Branch, Gunners Branch, Great Seneca Creek, Little Seneca Creek, Wildcat Branch, Little Bennett Creek, Bennett Creek, Carroll Creek, Rock Creek, Monocacy River, Tuscarora Creek and their tributaries. Bridge and culvert crossings of streams have been known to cause considerable local degradation of stream channels, often causing backwater or increased downstream scour, sediment deposition, over-widening and bank erosion. Depending on design, culverts can cause siltation of the channel substrate and reduce the surface area available for macroinvertebrate colonization and fish refugia.

Alternate 5C will have the most impact to streams in the I-270/US 15 corridor due to the addition of direct access ramps at I-370 (not preferred), MD 118, and MD 85/Shockley Drive. This general-purpose lane will require additional bridge extensions in which the cut and fill area will be expanded to accommodate this construction. These impacts would be associated with culvert or bridge extensions in portions of the stream already disturbed by the existing crossing.

The proposed park and ride lots and yard/shop facilities will require extensive areas of impervious pavement. Uncontrolled runoff from impervious surfaces can potentially impact stream stability through chemical pollution, thermal loading, and alteration of in-stream habitat. Most of these highway and transitway facilities, including the transitway alignment, cross first order streams that are typically the most sensitive to the destabilizing effects of channel changes. These indirect impacts are caused by increases in level and frequency of peak discharges in receiving streams and by the introduction of pollutants that typically accumulate on road surfaces and become mobilized during rain events. Clearing and grading of forested land would be required to construct these facilities and the transitway alignment, reducing shade and increasing water temperatures within the stream. These impacts will be most evident in streams crossed by the transitway due to its extension through relatively undisturbed landscapes. In addition, thermal loading could significantly alter in-stream habitat for streams with a Class III or Class IV designation, due to the temperature requirements needed for trout populations. Those streams with a Class III or IV designation include Little Seneca Creek, Carroll Creek, Rock Creek, and Tuscarora Creek. Refer to **Table III-50** for water quality criteria specific to the designated use.

4. Wild and Scenic Rivers

a. Existing Conditions

The DNR Wild and Scenic Rivers program was developed to protect the scenic, recreational, and aquatic habitat values of the state's wild and scenic rivers. Rivers under this program are protected from development that would diminish the character of the resource. The Monocacy River, which crosses the I-270/US 15 Corridor near Urbana in Frederick County, is designated as a state wild and scenic river.

The Monocacy River is the largest Maryland tributary of the Potomac River. It originates near the Maryland and Pennsylvania border at the confluence of Marsh and Rock Creeks. From its origin, the river flows south to Double Pipe Creek, marking the border between Frederick and Carroll counties. The stream flows south solely within Frederick County and east of Frederick City until it empties into the Potomac River.

The Monocacy River watershed includes the town of Frederick, 13 miles upstream from its confluence with the Potomac River. The forests adjacent to the river within the project area lie within the Monocacy National Battlefield, the site of a significant Civil War battle.

b. Impacts

The Monocacy River will not be directly impacted by the bridge extension associated with Alternates 3A/B, 4A/B, and 5A/B/C. Placement of bridge support piers for the widening of I-270 under Alternates 3A/B and 4A/B and the additional lane for Alternate 5A/B/C will occur in areas already cleared or maintained for the existing bridge. The natural character of the stream and its surroundings will not be altered from its human-induced condition near or adjacent to the existing bridge. Therefore, no impacts are anticipated to the Monocacy River under the Wild and Scenic Rivers Act.

c. Mitigation

The Monocacy River's designation as a State wild and scenic river does not require mitigation for impacts to this stream system. Instead, the designation is used to preserve the character of the river, not necessarily to halt development and use of the river.

5. Special Protection Areas

a. Existing Conditions

The Montgomery County Department of Environmental Protection (DEP) has designated a 4,646-acre area within the Little Seneca and Ten Mile Creek watersheds as a Special Protection Area (SPA). This area is identified as the Clarksburg SPA, which extends across the I-270 Corridor from the crossing of Ten Mile Creek north of the MD 121 interchange to the crossing of Little Seneca Creek south of West Old Baltimore Road. An SPA is a geographic area where existing water resources, or other environmental features directly relating to those water resources, are of high quality or are unusually sensitive. SPA lands are also those areas where proposed land uses would threaten the quality or preservation of those resources or features in the absence of special water quality protection measures which are closely coordinated with appropriate land use controls (Chapter 19, Section 19-61 of the Montgomery County Code).

Chapter 19, Article V of the Montgomery County Code requires that the DEP prepare a conservation plan for each SPA. The purpose of the conservation plan is to:

1) Describe the current status of aquatic living resources, physical stream habitat, and water chemistry conditions within each SPA watershed.

2) Identify critical natural resources (watershed hydrology, stream channel morphology, water quality, aquatic habitat, sediment loading, etc.), which must be protected to achieve and maintain a high level of water quality protection that, at a minimum, meet established state water quality standards as defined in COMAR 26.08.01-.04.

3) Provide guidance in establishing site specific performance goals for development projects and other land disturbance activities within Special Protection Areas (SPA).

Performance goals are established for each development project within the SPA and are intended to enhance protection of on-site water resources or other features relating to those water resources during the development process. The SPA conservation plan provides guidance for the development of site specific performance goals. Through the SPA process, innovative site layouts and linked best management practices are required to maximize the protection of water quality, stream habitat, and aquatic life.

b. Impacts

The Maryland-National Capital Park and Planning Commission (M-NCPPC) and the Montgomery County Department of Park and Planning (MCDPP) have developed guidelines for the protection of natural resources within environmentally sensitive areas designated as Special

Protection Areas (SPAs). The Clarksburg SPA crosses I-270 and includes the Little Seneca Creek watershed north and south of MD 121. To protect water resources within the SPA, implementation of these guidelines in conjunction with County water quality regulations could result in expanded wetland buffers, expanded and accelerated forest conservation, and imperviousness limitations.

Expanded wetland buffers are dependent on the watershed use category. The Little Seneca Creek watershed is use IV, recreational trout waters. Within this designated use, the expanded buffer could extend up to 125 feet from the edge of the stream bank or wetland depending upon whether the wetland is a wetland of special state concern, the proximity of steep slopes, and the presence of highly erodible soils.

Expanded and accelerated forest conservation will be required for alternates within the SPA that are subject to Montgomery County Forest Conservation requirements. These requirements will include the retention or establishment of forest in all buffers on a site and will include a five-year maintenance plan and the planting of trees that are three to four feet in height and shrubs that are 18 to 24 inches in height.

With respect to imperviousness limitations, the Clarksburg SPA has an impervious limit of 15 percent to the entirety of each site. The imperviousness coverage must be calculated over the entire project property.

c. Mitigation

Compliance with the M-NCPPC and MCDPP guidelines for the Clarksburg SPA will be investigated during final project design. No mitigation requirements are addressed in the SPA guidelines; however, these details will need to be addressed during project specific review.

6. Floodplains

a. Existing Conditions

US Department of Transportation Order 5650.2 entitled "Floodplain Management and Protection" prescribes policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of floodplain impacts.

DOT Order 5650.2 defines "significant floodplain encroachment" as an encroachment resulting in one or more of the following construction or flood-related effects:

- A considerable probability of loss of human life;
- Likely future damage associated with the encroachment that could be substantial in cost or extent, including interruption of service on or loss of a vital transportation facility; and
- A notable adverse impact on natural and beneficial floodplain values.

The Order further defines natural and beneficial floodplain values to include but not be limited to: natural moderation of floods, water quality maintenance, groundwater recharge, fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, and forestry.

The Federal Emergency Management Agency (FEMA) estimated floodplain limits for 100-year storm events using Flood Insurance Rate (FIR) Maps for Montgomery and Frederick counties. FEMA delineates 100-year (Zone A) and 500-year (Zone B) floodplains on the FIR maps as part of the Flood Insurance Program. The 100-year floodplain refers to the areas along or adjacent to a stream or body of water that are capable of storing or conveying floodwaters during a 100-year frequency storm. The approximate locations of the 100-year floodplains of all major streams have been shown for the project area (See **Figure III-20**).

Proposed Highway Alignment

The FEMA designated 100-year floodplains within the I-270/US 15 Corridor highway alignment parallel the main stems of Muddy Branch, Long Draught Branch, Great Seneca Creek, Gunners Branch, Little Bennett Creek, Bennett Creek, Monocacy River, Rock Creek, Carroll Creek, Tuscarora Creek and their tributaries.

Most of the prominent streams located in Montgomery County and the southern portions of Frederick County are bordered by forested 100-year floodplains that range in size from 1,000 to 2,000 feet in width. Most of these forested stream valleys have been retained as public parks or recreation areas in which minimal disturbance is allowed due to their aesthetic and historical value. The existing I-270/US 15 roadway bisects these areas with bridge and culvert spans that have support components placed within the 100-year floodplain itself. Additional engineering and assessment of impacts may be required to obtain a permit for placing additional bridge piers and culverts within these FEMA designated floodplains.

The 100-year floodplains associated with the tributaries of Muddy Branch, Long Draught Branch, Great Seneca Creek, Ballenger Creek, Carroll Creek, and the Monocacy River either bisect or parallel the I-270/US 15 Corridor in frequently maintained interchanges or road rights-of-way. These FEMA designated floodplains are relatively small in size compared to the main stems into which these tributaries flow. Frequent disruption and alteration of the floodplains occur within the interchanges and along the I-270/US 15 Corridor due to the removal of vegetation for roadway maintenance and the use of riprap and concrete to stabilize the tributaries.

Proposed Park and Ride Lots

There are no FEMA designated 100-year floodplains within the proposed park and ride lots at Liberty Road and Biggs Ford Road. However, the 100-year floodplain of Tuscarora Creek extends through the northeastern half of the proposed park and ride at Trading Lane. This portion of the floodplain is primarily active farmland with areas of wetland situated throughout. The FEMA floodplain is frequently disturbed due to agricultural practices and adjacent development.

Proposed Transitway Alignment

The transitway alignment traverses many of the same 100-year floodplains associated with the I-270 Corridor highway alignment due to its north-south alignment along the roadway. In areas where the transitway is situated within the I-270 right of way, similar portions of the floodplain are crossed for Great Seneca Creek, Gunners Branch and their tributaries. Other portions of the 100-year floodplains for Muddy Branch and its tributary are intersected as the transitway deviates east and west of the I-270 right of way to the proposed station locations.

The largest floodplains in width (600-1,000 feet), compared to other streams within the transitway, include Muddy Branch, Gunners Branch, and Great Seneca Creek. Forested tracts that extend perpendicular to the transitway surround these streams. Further analysis of impacts and engineering constraints may be required for those floodplains near existing roads, in which additional culverts or bridge piers will be placed for the transitway alignment.

Proposed Transit Stations and Yard/Shop Facilities

A portion of the 100-year floodplain associated with a tributary to Great Seneca Creek is located in proposed sites 1-3 at Metropolitan Grove. The floodplain is located in a relatively undisturbed area where low-density residential development is the surrounding land use. A large forested tract with mid to late successional trees characterizes the current conditions of the FEMA floodplain.

b. Impacts

The significance of floodplain encroachment was evaluated with respect to the criteria in Executive Order 11988 (Floodplain Management). Floodplain encroachment was also analyzed according to the Federal Aid Highway Program Manual which recommends that longitudinal encroachment (encroachment that parallels the stream channel) be avoided whenever possible. Project alternates are not configured in such a manner that major longitudinal floodplain encroachments will occur. The majority of floodplain encroachments will be from transverse crossings for each of the build alternates and the transitway alignment (encroachment from roadway development that crosses the valley widths of floodplains). **Table III-52** present the potential encroachment into FEMA designated 100-year floodplains by the alternates and facilities associated with highway and transitway alignments.

TABLE III-52
COMPARISON OF FLOODPLAIN IMPACTS FOR THE HIGHWAY AND TRANSITWAY ALIGNMENTS (ACRES)

Alternates	Alignment		
	Highway	Transitway[1]	Alternate
1: No-Build	0	0	0
2: TSM/TDM Alternate	3	0	3
3A: Master Plan HOV/LRT	20	3	23
3B: Master Plan HOV/BRT	20	3	23
4A: Master Plan General-Purpose/LRT	20	3	23
4B: Master Plan General-Purpose/BRT	20	3	23
5A: Enhanced Master Plan HOV/General-Purpose/LRT	21	3	24
5B: Enhanced Master Plan HOV/General-Purpose/BRT	21	3	24
5C: Enhanced Master Plan HOV/General-Purpose/Premium Bus	21	N/A	21

[1] *Transitway impacts include transit stations.*
NA Not applicable

Alternate 1

Alternate 1 is the No-Build alternate and as such is not anticipated to impact the 100-year floodplains within the Corridor.

Alternate 2

Alternate 2 is the TSM/TDM alternate, which includes the construction of park and ride lots in Frederick County at the intersections of US 15/MD 26, US 15/Trading Lane, and US 15/Biggs Ford Road. Approximately three acres of the 100-year floodplain for Tuscarora Creek will be impacted by the construction of the US 15/Trading Lane park and ride lot. There are no FEMA floodplains associated with the US 15/MD 26 and US 15/Biggs Ford Road park and ride lots.

Alternates 3A/B and 4A/B

Alternates 3A/B, the Master Plan HOV alternate, and Alternates 4A/B, the Master Plan General-Purpose alternate are nearly identical and the potential effects for both alternates will result in the same amount of impact. These two alternates are, therefore, assessed together.

Highway Alignment

Impacts to 100-year floodplains for Alternates 3A/B and 4A/B will occur in portions of the floodplain that have already been disturbed by the existing I-270/US 15 highway crossing. Alternates 3A/B and 4A/B will impact approximately 20 acres of 100-year floodplains associated with Muddy Branch, a tributary to Muddy Branch, tributary to Great Seneca Creek, Great Seneca Creek, Monocacy River, Carroll Creek, Rock Creek, and Tuscarora Creek. The floodplain of the Monocacy River is part of the National Battlefield designation for this stream system. However, this designation does not warrant different mitigation requirements than those stated by FEMA and MDE.

Transitway Alignment

The transitway alignment will impact approximately three acres of the 100-year floodplains associated with Muddy Branch, Gunners Branch, Great Seneca Creek, and a tributary to Great Seneca Creek. Potential impacts to floodplains are more significant for the transitway as the alignment extends through relatively undisturbed landscapes. Vegetation removal and grading for the track bed and the transit station at Muddy Branch could alter the flow regime of the 100-year flood event as well as increase the potential for downstream flooding of residential and commercial areas.

Proposed Transitway Yard/Shop Facilities

The proposed shop facilities for the Metropolitan Grove sites 1-3 will impact 1.3 acres of a 100-year floodplain associated with a tributary to Great Seneca Creek. The removal of woody vegetation in this area could significantly impact the 100-year floodplain by reducing floodflow storage and increasing erosive forces within the stream.

Alternate 5

The impacts to FEMA floodplains associated with Alternates 5A/B/C are identical for the highway alignment. Alternates 5A and 5B have the same impacts to 100-year floodplains under the transitway option. Due to the replacement of the transitway alignment with a premium express busway, Alternate 5C will use the direct access HOV lanes along the highway alignment. Therefore, impacts to FEMA floodplains for the transitway alignment are not anticipated for Alternate 5C.

Highway Alignment

Alternate 5 poses the greatest impact (21 acres) to 100-year floodplains due to the addition of a general-purpose lane between MD 121 and I-70, which impacts the same floodplains as Alternate 3 and 4 with the addition of Muddy Branch, Wildcat Branch, Little Bennett, and Bennett Creek. Refer to the highway option under Alternates 3A/B and 4A/B for the discussion of impacts associated with the 100-year floodplains that these alternates have in common. Additional impacts associated with Muddy Branch, Wildcat Branch, Little Bennett, and Bennett Creek occur in areas previously disturbed by the existing I-270 Corridor. Severity of impact is reduced as these landscapes have already been manipulated to accommodate existing bridge and stormwater designs.

Transitway Alignment

The proposed transitway alignment included in Alternates 5A/B is the same as that proposed under Alternates 3A/B and 4A/B. Therefore, the proposed transitway alignment under Alternates 5A/B will have the same potential impact to floodplains.

Proposed Transitway Yard/Shop Facilities

The proposed transitway yard/shop facilities are the same as those proposed for Alternates 3 and 4. Therefore, the proposed transitway alignment under Alternates 5A and 5B will have the same potential impact to 100-year floodplains.

c. Avoidance and Minimization

Efforts to minimize and avoid impacts to 100-year floodplains will continue throughout the planning and engineering process. Techniques that will be investigated to further minimize or avoid impacts may include alignment shifts to ensure the narrowest possible crossing, and bridging of floodplains to further reduce encroachment and allow for unrestricted passage of floodwaters. Hydrologic and hydraulic studies should be conducted to determine the bridge or culvert opening sizes for the various alternates.

d. Mitigation

All construction occurring within the FEMA designated 100-year floodplain must comply with FEMA approved local floodplain construction requirements. These requirements consider structural elevations, fill levels, and grading elevations. If, after compliance with the requirements of Executive Order 11988 and 11990 Floodplain Management, new construction of structures or facilities are to be located in a floodplain, accepted floodproofing and other flood protection measures shall be applied to new construction or rehabilitation. To achieve flood protection, wherever practicable, structures should be elevated above the base flood level rather than filling for culvert placement.

G. GROUNDWATER

1. Existing Conditions

The availability of groundwater is largely controlled by the geology of an area. The I-270/US 15 Corridor highway and transitway alignments, and associated facilities (park and ride lots, stations, and yard/shop facilities) are located within the Piedmont physiographic province, which can be subdivided topographically into lowland and upland areas. These areas are underlain by dense, almost impermeable bedrock that yields water primarily from secondary porosity and permeability provided by fractures. Aquifer recharge areas are highly variable in the Piedmont province because it is determined by local precipitation and runoff, which are influenced by topographic relief and the capacity of the land surface to accept infiltrating water. Groundwater throughout the Piedmont occurs primarily under water table conditions (unconfined) with the depth to water averaging approximately 30 feet below the land surface (The Status of the Quantity and Quality of Groundwater in Maryland, 1982, DNR).

An aquifer is a geologic formation such as fractured rock or coarse sand, which possesses the porosity required to store and transmit water in usable quantities. Three principal types of bedrock aquifers underlie the Piedmont province: crystalline rock, aquifers in early Mesozoic basin, and carbonate-rock aquifers.

The Wissahickon and the Marburg Formations extend throughout most of the I-270/US 15 Corridor highway and transitway alignments in Montgomery County. These two major aquifers are composed of crystalline metamorphic and igneous rocks, which are overlaid with an unconsolidated, porous material called regolith. The regolith and fractures in the bedrock serve as the principal places for storage and transmission of water. Groundwater movement is generally along short flow paths from interstream recharge areas to the nearest stream.

The rocks of the early Mesozoic basin include beds of sandstone, arkose, and conglomerate that were originally porous. However, due to compaction and cementation, the pores have been reduced in size and are now poorly connected. Therefore, groundwater in the Mesozoic rock moves primarily along joints, fractures, and bedding planes with little hydraulic connection between individual aquifers.

The carbonate-rock aquifers within the Piedmont province are composed of rocks that have a fair degree of permeability or porosity due to solution weathering along bedding planes, joints, faults, and other partings. The Frederick Limestone Formation and the Grove Limestone Formation are the two types of major carbonate aquifers within Frederick County. These highly productive aquifers provide much of the water used for public supply in Frederick County.

Most of the water withdrawn from the crystalline-rock and undifferentiated sedimentary-rock aquifers is used for domestic and commercial supplies. The water used for public supply is primarily withdrawn from the aquifers in early Mesozoic basins and the carbonate-rock aquifers.

A portion of the Maryland Piedmont aquifer that begins at Darnestown-Germantown Road and extends north to Fingerboard Road has been designated by EPA as a sole source of drinking water for parts of Montgomery and Frederick counties. EPA's Sole Source Aquifer (SSA) program allows individuals and organizations to petition the EPA to designate aquifers as the "sole or principal" source of drinking water for an area. The program was established under Section 1424(e) of the Safe Drinking Water Act (SDWA) of 1974 to provide EPA review of federal financially assisted projects planned for an area and to determine their potential for contaminating the aquifer so as to create a significant hazard to public health.

Approximately 62% of the domestic drinking water used in this area is supplied by this groundwater aquifer. Water enters the designated portion of the Maryland Piedmont Aquifer through local precipitation, which creates water table conditions throughout the designated area. The designated area includes portions of the Piedmont aquifer, its streamflow source zone, and its recharge zone, which are one in the same. This area consists of the following drainage and sub-drainage basins within both the highway and transitway alignments:

- Little Seneca Creek Basin - from the headwaters of Little Seneca Creek to the confluence with Great Seneca Creek, including the Ten Mile Creek and Bucklodge Creek drainage basin.
- Little Bennett Creek Basin - from the headwaters of Little Bennett Creek to the confluence with Bennett Creek.
- Bennett Creek Basin - from the headwaters of Bennett Creek to the confluence with Little Bennett Creek.

Groundwater Quality

Groundwater in both Montgomery and Frederick counties is an abundant natural resource that serves as a significant source of drinking water and a source of water for industrial and agricultural uses. Groundwater also contributes sub-surface and base flow water to the streams and wetlands throughout these counties.

The EPA applies drinking water standards to groundwater that is used as a public drinking water supply. These standards are defined as maximum contaminant levels (MCL), which determine the maximum concentration of a pollutant permitted in drinking water. These contaminants include inorganic and organic chemicals, radionuclides, and microorganisms. Public water supplies that exceed the MCL are required to immediately address the problem by altering the treatment effort or closing down the well.

The quality of groundwater varies depending on the different rock types found within the aquifers of the Piedmont province. Water supplies from these aquifers are generally suitable for drinking and other uses. Iron, manganese, and sulfate can occur locally in large concentrations. These constituents are not regulated but can cause cosmetic effects such as skin or tooth discoloration or aesthetic effects that include taste, odor, or color. The National Secondary Drinking Water Regulations are non-enforceable guidelines that regulate these contaminants based on their cosmetic and aesthetic effects in drinking water; water systems are not required to comply with permitted contaminant levels. Large iron concentrations can be attributed to corrosion or the action of iron-fixing bacteria on iron and steel casings and well fittings. Manganese concentrations are found in the crystalline rock and undifferentiated sedimentary-rock aquifers. These minerals, when weathered, can contribute both iron and manganese to groundwater, especially if the water is slightly acidic. The acceptable drinking water level for the concentration of hydrogen ions, which is measured in pH units, ranges from a slightly acidic 6.7 to a basic 7.6. These pH levels in groundwater are within the range set forth by the National Secondary Drinking Water Regulations.

The Maryland Geological Survey (MGS, 1989) and the US Geological Survey (USGS, 1997) have collected groundwater data from a network of wells and springs located in Montgomery and Frederick counties. Sampling of groundwater occurred between 1987 and 1997 for dissolved solids, nutrients, trace elements, radon, pesticides, volatile organic compounds, dissolved oxygen, and pH. Groundwater samples taken from wells, along the I-270/US 15 Corridor highway and transitway alignments in Montgomery County, exhibited low levels of total dissolved solids (TDS). Lower TDS values taken from wells within these non-carbonate crystalline aquifers are an indication that supply potentially comes from sites of recharge. Samples were more acidic in these aquifers, with median pH values ranging from 5.3 to 6.7. Wells in the carbonate aquifers of Frederick County and northern portions of Montgomery County provided samples higher in pH and TDS values than those from the crystalline aquifers in more southern portions of Montgomery County. Trace-element concentrations from all groundwater samples throughout the project area were generally low. Median iron concentrations ranged from 3 milligrams per liter (mg/l) to 30 mg/l (overall median: 12 mg/l) and median manganese concentrations ranged from <1 mg/l to 12 mg/l (overall median: 4 mg/l).

Existing and potential sources of groundwater contamination include landfills, underground storage tanks, injection wells, and improper storage of salt or other material on bare ground. Other sources of groundwater contamination that are not easily identified include septic systems, application of nutrients and pesticides, animal waste, urban runoff, highway de-icing, and land applications of sewage sludge and wastewater.

2. Impacts and Mitigation Measures

Regulatory, planning, and research programs for groundwater are implemented by the State of Maryland. The Maryland Department of Health and Mental Hygiene, through its Office of Environmental Programs is responsible primarily for regulatory and operational programs with regard to water quality aspects of groundwater. The DNR, the MDE Water Management Administration and the Maryland Geological Survey regulate groundwater use through an appropriation-permit program. Federal statutes further prevent groundwater contamination by protecting recharge areas or sole source aquifers. The Sole Source Aquifer of the Safe Drinking Water Act, Section 1424(e), allows the Administrator of EPA to designate the aquifers that serve as principal drinking water sources and to prevent a contamination of the aquifer that could lead to a significant hazard to public health.

Alternate 1

The No-Build Alternate (Alternate 1) reflects current and programmed conditions within the I-270/US 15 corridor; therefore, impacts to groundwater resources are not anticipated.

Alternate 2

Alternate 2 is the TSM/TDM alternate, which includes the construction of park and ride lots in Frederick County at the intersections of US 15/MD 26, US 15/Trading Lane, and US 15/Biggs Ford Road. The excavation required to construct these park and ride lots is only necessary to level the ground surface for paved areas. These sites are currently composed of relatively flat terrain, which reduces the depth of excavation needed during the construction process. Therefore, impacts to groundwater pathways and resources are not anticipated. The proposed park and ride lots will not impact the sole source aquifer as these sites are not located in the designated area of the aquifer.

Alternate 3A/B and 4A/B

Alternate 3A/B, the Master Plan HOV alternate and Alternate 4A/B, the Master Plan General-Purpose alternate are nearly identical, and with respect to the assessment of potential effects, the two alternates will result in the same level of impact and are therefore assessed together.

<u>Highway Alignment</u>

Most upgrades to the highway in Alternates 3A/B and 4A/B will occur at-grade with the existing I-270/US 15 highway, reducing the depth of excavation needed to construct these road improvements and preventing any alteration of groundwater flow within the Corridor. However, potential sources of groundwater contamination from highway deicing, urban runoff, and fuel

tank leakages may seep into groundwater supplies as the movement of water between surface water and groundwater provides a major pathway for chemical transfer between the terrestrial and aquatic systems. Implementation of BMPs during and after construction, such as stormwater management ponds, biofiltration systems, and the use of sediment/erosion control will reduce the amount of contaminants entering groundwater supplies by treating runoff from the roadway.

Both alternates traverse the designated area of the sole source aquifer within the Little Seneca Creek, Little Bennett Creek, and Bennett Creek basins. Indirect impacts to the aquifer may occur as highway constituents, such as those described above, enter groundwater supplies during storm events. However, the use of Best Management Practices will decrease the amount of time the constituent spends in the aquifer and diminish the contamination to a level that does not pose a public health hazard.

Transitway Alignment

Under Alternates 3A/B, 4A/B, and 5A/B, the proposed transitway alignment includes either a LRT or BRT option. Both the LRT and BRT option will provide transitway stations. While many of these stations will include impervious areas of parking lots and buildings, most are proposed for construction on existing developed ground. Facilities proposed in undeveloped areas will use stormwater management BMPs to reduce pollutant runoff from impervious surfaces, thus reducing potential groundwater contamination and loss. Groundwater impacts from construction and operation of the light rail transit alignment would likely be less than for the bus option, as open track surfaces would provide less impervious surfaces and fewer potential sources of contaminants than paved roadways for bus transit.

Proposed Transitway Yard/Shop Facilities

The proposed transitway yard/shop facilities warrant larger areas of pavement than the proposed stations. The types of constituents entering groundwater resources are similar to those described in the highway alignment. However, a larger volume of pollutants is expected due to the increase in surface area. Filtration of these chemicals through bioretention facilities and the use of MDE stormwater management practices will need to be implemented to reduce the level of contaminant entering the groundwater systems. Impacts to the sole source aquifer are similar to those described in the highway alignment. Refer to the sections above for a detailed discussion on impacts associated with the sole source aquifer.

Alternate 5

Alternate 5 is the Enhanced Master Plan HOV/General Purpose alternate. The difference in this alternate compared to Alternates 3 and 4 is the inclusion of both an HOV and general-purpose lane in each direction along I-270 between MD 121 and I-70. Alternate 5C includes the addition of direct access ramps at I-370, MD 118, and MD 85/Shockley Drive for the premium express busway.

Highway Alignment

The highway improvements associated with Alternate 5 between I-370 and MD 121 are the same as those for Alternates 3A/B and 4A/B. Therefore, potential effects to groundwater are also the same. The additional lane in Alternates 5A/B/C may contribute a higher volume of pollutants due to increased surface area, but the difference is not significant enough to distinguish between the alternates. Refer to the highway option under Alternates 3A/B and 4A/B for a detailed discussion on effects to groundwater.

Proposed Transitway Yard/Shop Facilities

The proposed transitway yard/shop facilities are the same as those proposed for Alternates 3A/B and 4A/B. Therefore, the potential impacts to groundwater resources are also the same as those proposed for Alternates 3A/B and 4A/B.

H. HABITAT AND WILDLIFE

1. Terrestrial Habitat and Wildlife

a. Existing Conditions

The I-270/US 15 Corridor extends from a mostly urban, developed landscape at the southern end to a mostly rural, but rapidly developing landscape at the northern end. However, between the north and south ends, the Corridor crosses several large undeveloped parklands that provide relatively undisturbed habitat for wildlife. Terrestrial habitats along the Corridor were identified through field reconnaissance and generally fall into four categories: agricultural, developed, old field, and forest.

Highway Alignment

Along the highway alignment, including proposed MD 75 extended, agricultural areas include crop fields such as corn and soybean, hay, and pastures. Thin strips of natural shrub or tree growth forming hedgerows and treelines, often divide agricultural fields with different cover types. Developed habitats include residential, commercial, and institutional areas with manicured lawns and tree and shrub plantings. Old fields represent abandoned agricultural fields that are in various stages of succession to a forested condition if left undisturbed. Grasses, wildflowers, briers, shrubs, and small trees generally dominate these habitats. Forest habitat generally occurs as small buffer strips in developed and agricultural areas. Larger forest tracts are generally associated with stream valleys, wetland areas, or steep-sloped lands, which have been restricted from development by regulation or inaccessibility. Other large forest tracts occur on local, state, or federal parklands.

Agricultural land: occurs primarily along the northern portion of the Corridor north of MD 118. Some agricultural land still exists south of MD 118, however, it is converting rapidly to residential, commercial, and institutional uses. This conversion is also rapidly occurring between MD 118 and MD 121. Larger areas of agricultural habitat occur between MD 121 and the City of Frederick along I-270 and between the City of Frederick and Biggs Ford Road along US 15.

Much of this area is also experiencing a loss of agricultural land to residential and commercial developments. However, at the Monocacy National Battlefield within the Corridor, nearly 1,600 acres of agricultural land will be preserved.

The majority of agricultural land is in crop fields and pasture for dairy farm operations. Corn, soybean, and hay are the primary crops grown in these areas. Corn and soybean fields do not maintain a high diversity of wildlife species, however, various species will visit the fields for food. They may include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), white-footed mouse (*Peromyscus leucopus*), American crow (*Corvus brachyrhynchos*), red-winged blackbird (*Agelaius phoeniceus*), mourning dove (*Zenaida macroura*), Canada goose (*Branta canadensis*), and ring-necked pheasant (*Phasianus colchicus*).

Hay fields can be good habitat for grassland nesting species if cutting cycles allow for completion of breeding prior to the first harvest. Common grassland nesting birds and other wildlife include grasshopper sparrow (*Ammodramus savannarum*), red-winged blackbird, Eastern meadowlark (*Sturnella magna*), meadow vole (*Microtus pennsylvanicus*), groundhog (*Marmota monax*), and red fox (*Vulpes vulpes*). Other species may only forage within hay fields or over-winter in this habitat, especially if native warm season grasses are used. Warm season grasses include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*). Warm season grasses thrive during the heat of the summer and go to seed late in the summer. This provides food for wildlife throughout the fall and early winter months. Hay fields that have been converted to warm season grassland habitat occur at the Monocacy National Battlefield. Species that may hunt these fields or use them during the winter include birds of prey such as red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and barn owl (*Tyto alba*); white-tailed deer; savannah sparrow (*Passerculus sandwichensis*); and dark-eyed junco (*Junco hyemalis*).

Pasture for dairy cattle grazing is generally comprised of low-growing cool season grasses such as fescue (*Festuca* spp.) that are of limited value to wildlife species. Wildlife commonly associated with dairy farms include invasive species that thrive in human-induced environments such as European starling (*Sturnus vulgaris*), brown-headed cowbird (*Molothrus ater*), rock dove (*Columba livia*), and house sparrow (*Passer domesticus*).

Developed habitat: occurs within the metropolitan areas of the Corridor, particularly the cities of Rockville, Gaithersburg, Germantown, and Frederick. Many of the residential, commercial, and institutional developments in these areas were built on former agricultural land, and are thus comprised of recently planted lawn grasses, shrubs, and trees. Much of this planted vegetation is comprised of ornamental and non-native species. Consequently, much of the wildlife using these areas, such as the European starling, is adapted to human-modified environments. However, where development has occurred adjacent to agricultural land or parkland, or where wildlife has been displaced because of the development, other wildlife species may temporarily use these habitats. These species include white-tailed deer, fox, raccoon, opossum, and mice. In older residential developments where landscape plantings have matured and a variety of fruit or seed producing trees, shrubs, and herbaceous plants occur or where people supply food in specially designed feeders, many species of birds can be found. These species that can inhabit smaller, more disturbed sites with a mix of vegetation types include gray squirrel (*Sciurus carolinensis*),

eastern chipmunk (*Tamias striatus*), tufted titmouse (*Baeolophus bicolor*), Carolina Chickadee (*Poecile carolinensis*), Carolina wren (*Thryothorus ludovicianus*), red-bellied woodpecker (*Melanerpes carolinus*), and downy woodpecker (*Picoides pubescens*).

Old field habitat: occurs where agricultural fields have been abandoned. This habitat type is the least abundant of the terrestrial habitats along the I-270/US 15 Corridor. Small areas exist primarily in the northern half of the Corridor where agricultural fields are still relatively numerous. The old field community varies in structure depending upon the time since the last disturbance. Newly abandoned agricultural land in early succession provides primarily grasses and wildflowers that can be important for birds, small mammals, and insects such as butterflies and bees. Many of the same grassland species of birds described above for hay fields commonly occur in these habitats. Older fields, where succession has advanced to the small tree and sapling stage and where plant species diversity has increased, provide resources for a wider variety of wildlife. Within the study area, wildlife species commonly occurring in these habitats include white-tailed deer, meadow vole, shrew, fox, groundhog, eastern cottontail (*Sylvilagus floridanus*), black rat snake (*Elaphe obsoleta*), eastern garter snake (*Thamnophis sirtalis*), field sparrow (*Spizella pusilla*), gray catbird (*Dumetella carolinensis*), brown thrasher (*Toxostoma rufum*), common yellowthroat (*Geothlypis trichas*), yellow-breasted chat (*Icteria virens*), and house wren (*Troglodytes aedon*). Where small mammal populations are abundant, birds of prey such as red-tailed hawk and American kestrel are also common.

Forest habitat: occurs as small strips between developments or farm fields and larger tracts along stream valleys, within wetlands, on steep-sloped areas, and within parklands. The dominant forest types are deciduous except where earlier successional stands contain a predominance of pine. While considerable development has occurred along the Corridor, particularly at the southern end, large forested tracts still remain within protected parkland. From south to north along the Corridor, larger tracts of forest occur along Muddy Branch (Summit Hall and Muddy Branch Parks), within Brown's Station Park, along Great Seneca Creek, along and adjacent to Little Seneca Creek (Black Hill Regional Park), along Little Bennett Creek, and along the Monocacy River (Monocacy National Battlefield). Smaller woodlots occur elsewhere along the Corridor.

According to the Vegetation Map of Maryland, the I-270/US 15 Corridor intercepts five forest associations including sugar maple - basswood; chestnut oak; tulip poplar; sycamore - green ash - box elder - silver maple; and river birch - sycamore. The Vegetation Map of Maryland shows a band of sugar maple - basswood vegetation in the extreme northern portion of the US 15 Corridor between Tuscarora Creek and Biggs Ford Road. However, this area is completely agricultural and devoid of forested vegetation.

The tulip poplar association is mapped from south of Tuscarora Creek, through the city of Frederick to the Monocacy River, between Bennett and Little Bennett Creeks, adjacent to Little Seneca Creek, and from MD 118 to the south end of the study area. The dominant canopy tree within the association is tulip poplar (*Liriodendron tulipifera*). Within the I-270/US 15 Corridor most of the forested areas occurring on gently sloped uplands were observed to belong to this association. The species composition of these forests is similar to the described type association

except where disturbance has favored early successional species such as Virginia pine (*Pinus virginiana*) or invasion by non-native species such as tree of heaven (*Ailanthus altissima*).

The sycamore - green ash - box elder - silver maple association is mapped along the major waterways including Tuscarora Creek, Rock Creek, Monocacy River, Bennett Creek, Little Bennett Creek, Ten Mile Creek, Little Seneca Creek, and Great Seneca Creek. Sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), and silver maple (*Acer saccharinum*) make up the majority of the stocking. This forest association was confirmed along the Corridor highway alignment at each of the major stream crossings, and included forested wetlands and riparian areas.

The chestnut oak association is mapped from south of the Monocacy River to Bennett Creek, between Bennett and Little Bennett Creeks, from south of Little Bennett Creek to Little Seneca Creek, and between Little and Great Seneca Creeks. This forest association typically occurs on rocky, steep-sloped terrain. Chestnut Oak is the dominant canopy tree. Small areas of this forest association were observed within Black Hill Regional Park, Little Bennett Regional Park, and the Monocacy National Battlefield.

The river birch - sycamore association is mapped along the Muddy Branch floodplain within the I-270/US 15 Corridor highway alignment. River birch (*Betula nigra*) and sycamore are the dominant canopy trees within this association. The Vegetation Map of Maryland shows this forest association extending along Muddy Branch to I-270. No forest stand was identified in this location within the project area, however, scattered sycamore and river birch were observed.

The forests along the I-270/US 15 Corridor vary in their ability to support wildlife depending upon the size, degree of disturbance, community structure, presence of streams or wetlands, and proximity to other habitats. The small forest strips within the developed landscape generally support the fewest wildlife species. These patches of forest are often disturbed and contain many low quality exotic plant species. Typical wildlife using these areas includes those disturbance tolerant species described above.

The larger forest tracts along the Corridor support a greater diversity of both plant and animal species, but also vary depending upon the amount of human-induced or wildlife-induced disturbance. Most forests along the Corridor contain a large population of white-tailed deer. These deer herds have eaten much of the understory of the forests, changing the natural vegetation composition and, in many areas eliminating low cover for many species of wildlife. Generally these larger forest tracts still support a wide variety of both resident wildlife and migratory bird species. Common resident wildlife species include raccoon, opossum, gray squirrel, southern flying squirrel (*Glaucomys volans*), eastern chipmunk, white-footed mouse, big brown bat (*Eptesicus fuscus*), star-nosed mole (*Condylura cristata*), short-tailed shrew (*Blarina carolinensis*), striped skunk (*Mephitis mephitis*), box turtle (*Terrapene carolina*), American toad (*Bufo americana*), wood frog (*Rana sylvatica*), spring peeper (*Pseudacris crucifer*), spotted salamander (*Ambystoma maculatum*), red-backed salamander (*Plethodon cinereus*), brown snake (*Storeria dekayi*), eastern hognose snake (*Heterodon platyrhinos*), black rat snake, tufted titmouse, Carolina chickadee, white-breasted nuthatch (*Sitta carolinensis*), blue jay (*Cyanocitta cristata*), great horned owl (*Bubo virginianus*), red-bellied woodpecker, downy woodpecker, and

northern flicker (*Colaptes auratus*). Common migratory bird species include eastern wood-pewee (*Contopus virens*), ruby-throated hummingbird (*Archilochus colubris*), great-crested flycatcher (*Myiarchus crinitus*), and blue-gray gnatcatcher (*Polioptila caerulea*).

The largest forest tracts, those of 50 or more contiguous acres (see **engineering plan, sheets HWY 2** though **HWY 9** in **Volume 2 of 2, Chapter IX**), also provide habitat for a specialized group of birds known as forest interior dwelling birds or FIDS. These species require large tracts of forest to sustain viable breeding populations. DNR has designated twenty-five bird species that breed in Maryland as FIDS. The group includes colorful songbirds that breed in the mid-Atlantic region and migrate to Central and South America to spend the winter, as well as year round residents and short-distance migrants. Over the past 30 to 40 years many of these species have shown consistent population declines because of habitat loss on the wintering grounds and fragmentation of forests on the breeding grounds. Many of these species nest on or near the ground and are thus susceptible to mammalian predators such as raccoons, foxes, and skunks. Canopy nesting species are susceptible to predation by squirrels, blue jays, and crows. In smaller woodlots, concealment from these predators is more difficult. Those FIDS commonly encountered along the I-270/US 15 Corridor include resident species such as red-shouldered hawk (*Buteo lineatus*), hairy woodpecker (*Picoides villosus*), and pileated woodpecker (*Dryocopus pileatus*). Other commonly encountered FIDS include migratory species such as Acadian flycatcher (*Empidonax virescens*), wood thrush (*Hylocichla mustelina*), red-eyed vireo (*Vireo olivaceus*), northern parula (*Parula americana*), black-and-white warbler (*Mniotilta varia*), worm-eating warbler (*Helmitheros vermivorus*), ovenbird (*Seiurus aurocapillus*), Louisiana waterthrush (*Seiurus motacilla*), and scarlet tanager (*Piranga olivacea*).

Transitway Alignment

The proposed transitway alignment follows existing roadways and extends through mostly developed lands at the southern end of the project area. At the northern end, the transitway alignment crosses agricultural and forestland before terminating just north of the COMSAT Communications facility. A proposed hiker/biker trail parallels portions of the transitway alignment throughout its length.

The same terrestrial habitats were identified along the transitway alignment as along the I-270/US 15 Corridor highway alignment, including agricultural, developed, old field, and forest. Agricultural lands are primarily crop and hay fields often with shrub or tree lines separating fields. Developed areas provide managed lawn and landscaped shrub and tree plantings within residential, commercial, and institutional lots. Old field habitat occurs where agricultural lands have been left fallow or on vacant development lots. These habitats commonly consist of coastal broomsedge (*Andropogon virginicus*) grasses, brambles such as blackberries (*Rubus* spp.), and early successional woody plants such as red maple, black cherry, and red cedar (*Juniperus virginiana*). Forest associations occurring along the transitway alignment include all of those listed for the I-270/US 15 Corridor highway alignment except the sugar maple - basswood association. The associations found along the transitway alignment follow the same pattern as those along the I-270/US 15 Corridor highway alignment. The tulip poplar association occurs throughout the alignment on moist uplands, often adjacent to streams. The sycamore - green ash - box elder - silver maple association occurs along the major waterways in the northern portion of

the alignment while the river birch - sycamore association occurs along Muddy Branch. The chestnut oak association is scattered throughout the transitway alignment and occurs on steep-sloped uplands with thin soils.

The transitway alignment generally follows existing roadways and consequently overlaps only the edges of forest stands. Where the alignment crosses forest habitat is primarily east of the CSX railroad tracks at the Metropolitan Grove Metro Station. This forest is mapped in the tulip poplar association and is comprised of tulip poplar, mixed oaks, hickories, red maple, and American beech in the canopy. Understory vegetation is comprised of arrowwood, flowering dogwood, spicebush, low bush blueberries, poison ivy, grape, Virginia creeper, and Japanese honeysuckle. The alignment passes through additional portions of forest habitat south of the Little Seneca Creek crossing and at its terminus just north of the COMSAT Communications facility. Both of these woodlots are mapped within the tulip poplar association. The forest stand south of Little Seneca Creek is mature, occurs on a north-facing slope and is dominated by tulip poplar and mixed oaks. Maples dominate the stand at the north end of the transitway alignment. None of the woodlots crossed by the alignment are greater than 50 acres in size and, therefore, do not represent ideal FIDS habitat. These forest stands do provide habitat for many other wildlife species that occur within smaller patches of woods or wood edges. Representatives of these species were described above.

The transitway alignment includes stations with park and ride and walking access. The proposed transitway stations generally occur in developed or rapidly developing areas along the transitway alignment. Most proposed sites have already been cleared of vegetation and in many cases have been graded level for future construction. Some of these sites were cleared within deciduous and coniferous forest habitat, but only small strips of trees remain. At least two proposed station sites (Quince Orchard Park/Sioux Lane and COMSAT) contain old field habitat with scattered early successional forest, while one station site (Washingtonian) is presently a crop field.

Proposed Transitway Yard/Shop Facilities

Proposed transitway yard/shop facilities occur immediately adjacent to the proposed transitway alignment. Potential facilities are being investigated adjacent to the Shady Grove Metro Station, northeast of the Metropolitan Grove transit station, and at the proposed COMSAT rail terminus. At each potential location several yard/shop site options are being investigated. Following a thorough assessment of potential impacts and other constraints associated with each optional site, a single site will be selected.

The proposed Shady Grove Metro Station rail yard/shop facility sites under investigation occur on developed land with few landscaped trees and shrubs in the medians of parking lots or on small strips of land between buildings or lots that have not been maintained. The potential yardsites northeast of the Metropolitan Grove station occur within mostly steep sloped upland forest habitat of the tulip poplar association. Common canopy species include poplar, oaks, red maple, and cherry. One potential site includes a small parcel of agricultural land and rural residential developments. The forested habitat in this location is part of a large contiguous forest that provides suitable habitat for FIDS. The proposed rail yard/shop facility sites at COMSAT occur in areas with a mix of forest, old field, and developed conditions. A small pond is located

within yard/shop facility site 3. A tributary stream flows east through yard/shop facility sites 2 and 3 and enters an unnamed tributary of Little Seneca Creek within yard/shop facility site 1. Forested habitat is primarily riparian with red maple, poplar, and oaks comprising the dominant canopy species. This area provides excellent habitat for wildlife in a mosaic landscape of agriculture and riparian stream corridors.

b. Impacts

Terrestrial habitats will not be impacted by the No-Build Alternate and would be impacted by the TSM/TDM alternate and each of the build alternates. Effects to terrestrial resources will involve the conversion of habitat to impervious road, rail, or other associated facility. Effects could also result from the human-induced introduction of invasive non-native plant and animal species into undisturbed habitat adjacent to newly impacted sites. However, because the highway alignment alternates generally involve the addition of travel lanes immediately to the outside or within the median of the existing highway and the transitway alignment generally follows exiting roadways, the majority of these effects will be to maintained grassy strips or narrow rows of trees. The largest areas of potential impact to terrestrial habitats will occur within the proposed COMSAT transitway station, transitway yard/shop facilities, and portions of the transitway alignment. The transitway yard/shop facilities are mostly planned for undeveloped land adjacent to the transitway alignment. Proposed MD 75 extended represents potential habitat and wildlife impacts associated with a new roadway section. However, the majority of impacts are to active agricultural fields and disturbed forest and shrub habitat at a rubble landfill.

Table III-53 illustrates the relative impacts of each alternate on terrestrial forest habitats within the project corridor. A more specific discussion of effects to terrestrial habitat and wildlife from each alternate follows.

TABLE III-53
COMPARISON OF TERRESTRIAL FOREST IMPACTS FOR THE HIGHWAY AND TRANSITWAY ALIGNMENTS (ACRES)

Alternate	Alignment		
	Highway	Transitway [1]	Alternate Total
1: No-Build	0	0	0
2: TSM/TDM Alternate	0	0	0
3A: Master Plan HOV/LRT	156	27	183
3B: Master Plan HOV/BRT	156	27	183
4A: Master Plan General-Purpose/LRT	156	27	183
4B: Master Plan General-Purpose/BRT	156	27	183
5A: Enhanced Master Plan HOV/General-Purpose/LRT	172	27	199
5B: Enhanced Master Plan HOV/General-Purpose/BRT	172	27	199
5C: Enhanced Master Plan HOV/General-Purpose/Premium Bus	180	NA	180

1 Transitway impacts include transit stations.
NA Not applicable

Alternate 1

Alternate 1 is the No-Build Alternate and as such is not anticipated to have effects on terrestrial habitat or wildlife.

Alternate 2

Alternate 2 is the TSM/TDM alternate, which includes the construction of park and ride lots in Frederick County at the intersections of US 15/MD 26, US 15/Trading Lane, and US 15/Biggs Ford Road. Construction of proposed park and ride lots will result in land use changes from agricultural to developed. No forest impacts are anticipated, though, there will be a loss of cropland at all three of the proposed lots. Minor wildlife displacements will occur from these improvements. These displacements are made more of a concern because of additional planned development associated with these interchanges. However, wildlife diversity in crop fields and pastures is generally low compared to that of other habitat types.

Alternates 3A/B and 4A/B

Alternate 3A/B, the Master Plan HOV alternate and Alternate 4A/B, the Master Plan General-Purpose alternate are nearly identical and with respect to the assessment of potential effects, the two alternates will result in the same level of impact and are therefore assessed together.

Highway Alignment

With the exception of a few interchanges and proposed MD 75 extended, highway alignment improvements under Alternates 3A/B and 4A/B will generally involve the widening of existing roadways. From Shady Grove Road to approximately MD 109 and the Monocacy River to the northern terminus along US 15 at Biggs Ford Road, the widening will be to the outside of the existing highway. This will result in encroachment effects on adjacent habitat. Between approximately MD 109 and the Monocacy River the road widening will be to the inside, which will affect only managed grassy strips in the median. Proposed interchange improvements will result in additional impacts to terrestrial habitats, particularly where ramps are proposed outside the current interchange configuration. Proposed MD 75 extended will impact primarily agricultural habitat and narrow tree rows, however, the alignment does cross several smaller forest stands resulting in approximately two acres of forest impact.

Forest impacts associated with the highway alignment for Alternates 3A/B and 4A/B are estimated to be 156 acres. Much of this impact occurs where the outside lane additions will encroach upon the large, undeveloped parks (Seneca Creek State Park and Black Hill Regional Park) and stream crossings (Great Seneca Creek, Little Seneca Creek, Little Bennett Creek) in Montgomery County. Other large forested areas that will receive encroachment impacts occur adjacent to I-270 just south of MD 118; between MD 121 and Comus Road, and north and south of the truck weigh station. These larger forested tracts are characterized by mostly mature upland deciduous vegetation. Roadway widening adjacent to stream crossings will result in encroachment impacts to riparian forest and forested wetland habitat. These larger forested tracts support breeding populations of FIDS. Encroachment impacts will slightly reduce the size of these forested tracts, however, it should not affect their suitability as FIDS habitat. The overall

forest impacts along the I-270 alignment also include disturbance of smaller, more isolated stands of forest. These forest patches support fewer wildlife species and smaller numbers of individuals than the larger, more contiguous forest stands. Nevertheless, elimination of these small habitats may lead to localized displacements of individuals and species.

Minor interchange improvements assessed in this document are planned at MD 117, MD 124, Middlebrook Road, MD 118, Father Hurley Boulevard, MD 85, and Jefferson Street. More significant improvements or newly planned interchanges occur at New Cut Road, MD 121, MD 75, MD 80, Trading Lane, and Biggs Ford Road. Minor interchange improvements will result in few encroachment impacts to forest habitat. These impacts are not considered significant and will have little effect on wildlife species using them. New interchanges or existing interchanges planned for major renovation will have greater affects on forest habitat. Proposed New Cut Road and its associated ramps to I-270 will impact upland and wetland forest west of I-270. This habitat is associated with a tributary of Little Seneca Creek. While the forest is only about 300 feet wide at the planned crossing of New Cut Road, it is part of a forested corridor that extends from Black Hill Regional Park to the south to forest and farmland habitat to the north. Baltimore Road interrupts the forest canopy to the south making it less desirable FIDS habitat. The road also reduces the connectivity of the habitat and provides a minor barrier to the movements of smaller amphibians and reptiles. However, the land on either side of Baltimore Road is valuable wildlife habitat because it provides requisite food, shelter, water, and nesting sites for birds and other wildlife. Its proximity to other habitat types also adds to the diversity in the area. Ramp construction on the east side of I-270 will impact about a third of a small (± 5-acre) upland deciduous woodlot on the COMSAT property. These impacts could result in displacements of individuals, but will not likely result in the loss of species.

Ramp improvements at MD 121 include a new ramp from northbound I-270 to MD 121 (southeast quadrant) and a new loop ramp from westbound MD 121 to southbound I-270 (northwest quadrant). The ramp improvements in the southeast quadrant could impact forest habitat east of I-270 and south of MD 121. These impacts would be to the edge of a 30 to 40-acre upland deciduous forest between I-270 and Gateway Center Drive. Ramp construction impacts would represent an encroachment to the habitat and would not significantly affect wildlife use of the area. The ramp improvements in the northwestern quadrant will occur within already maintained grassy vegetation. This area is of limited value to wildlife and is not considered an impact.

Another new I-270 interchange is planned at MD 75 extended. Under Alternates 3A/B and 4A/B this interchange will involve a loop ramp to the west of I-270 and a single exit and entrance ramp along northbound I-270. West of I-270, impacts will primarily be to cropland with small areas of impact to narrow upland deciduous forest rows. East of I-270 ramp construction will impact larger areas of mostly contiguous forest north and south of Mott Road. The upland coniferous and deciduous forest is less than 10 acres in size, and could be reduced by half (±5 acres) after road construction. This will result in displacements of wildlife species.

Ramp improvements at MD 80 will mostly impact old field habitat and cropland. However, small areas of upland deciduous forest will be impacted west of I-270. These impacts will be narrow and linear and will negatively affect wildlife resources by bisecting the habitat with a

road. However, planned development in this area will likely result in wildlife displacements regardless of roadway improvements.

New interchanges at Trading Lane and Biggs Ford Road will primarily impact cropland. These impacts will not disturb wildlife significantly, as cropland habitat does not support a large diversity of wildlife species. Also these impacts will be relatively minor within a landscape still dominated by this type of agricultural use.

Transitway Alignment

Under Alternates 3A/B and 4A/B, the proposed transitway alignment is being investigated as either a LRT or BRT option. Regardless of the mode of transit, the proposed alignment and corresponding impacts will be the same. As discussed above, the proposed transitway alignment follows existing or proposed roadways throughout most of its length from the Shady Grove Metro Station to COMSAT Station. This will minimize the extent of environmental impacts and will result mainly in encroachment impacts to terrestrial habitats. Overall forest impacts associated with the transitway alignment will total 27 acres.

The alignment extends away from existing roadways near the intersection of Decoverly Drive and Great Seneca Highway, between Great Seneca Highway and Twin Lakes Drive, between Metropolitan Grove Station and I-270, and through the United States Department of Energy (DOE) property. At Decoverly Drive the alignment crosses upland deciduous forest both east and west of Great Seneca Highway. These woodlots are relatively small remnant forest stands in a rapidly developing area. The relatively small size of these forests makes them suitable primarily to more generalist or edge-loving species of birds and other wildlife. According to the Master Plan for the area, the woodlot east of Great Seneca Highway is proposed for development. This will further reduce the available forested habitat in the region forcing wildlife into a smaller area. However, because of the nature of these wooded tracts, they will continue to provide habitat for generalist species, although many fewer individuals will be able to be supported in the smaller area.

The stretch of transitway between the Metropolitan Grove Station and I-270 will also pass through upland deciduous forest habitat. However, unlike the small, fragmented forest stands near Decoverly Drive, the forest adjacent to proposed Watkins Mill Road east of Metropolitan Grove Station is large, contiguous, and relatively mature. It is ideal FIDS habitat and likely supports many species of mammals, reptiles, and amphibians as well. The transitway will split this forest patch into two halves providing new openings for nest predators of FIDS such as brown-headed cowbirds. The clearing for the transitway should be as narrow as possible to minimize the disturbance to FIDS and other wildlife. The transitway between Great Seneca Highway and Twin Lakes Drive will pass through mostly old field habitat with scattered cedar trees. The land surrounding the transitway alignment through this area is planned for development according to the Master Plan. Therefore, even though the alignment itself will result in minor disturbance to this habitat, there will ultimately be little of the habitat remaining following complete build-out of the area. The transitway alignment through the DOE property will impact primarily managed lawn and other landscaped areas. A small area of mostly shrub

habitat between the DOE and the adjacent residential neighborhood will also be impacted. No significant effect on wildlife is anticipated, as wildlife use of this area is already limited.

The transitway alignment is also proposed to follow a planned roadway through forested habitat. This will occur along an extension of Observation Drive from Dorsey Mill Road to COMSAT. The alignment will impact an 800-foot wide mature upland deciduous forest just south of Little Seneca Creek. This forest patch is marginal FIDS habitat that will be further degraded by the transit crossing. The transitway will also impact pastureland within the floodplain of Little Seneca Creek and cropland between the creek and COMSAT. The transitway will also follow within the median of the planned extension of Century Boulevard from just south of MD 27 north to I-270. This extension will impact primarily open land that has been previously disturbed for development and for use as a driving range. These planned roadways will likely be built before or during the construction of the transitway lessening the overall impact on the resource from the transitway alignment.

Most of the proposed transit station sites occur on developed land or on land under development. Stations proposed to have park and ride facilities that are not currently developed or under development include Washingtonian, Quince Orchard Park/Sioux Lane, Manekin, and COMSAT. The Washingtonian station is presently a crop field, but is planned for development according to the Master Plan for the area. The Manekin station is presently a driving range with a fringe of trees comprising a narrow forested area on either side. Forest impacts associated with this station are less than one half acre. This area is planned for development with the extension of Century Boulevard. Quince Orchard/Sioux Lane Station is planned within old field and regrowth forest habitat between Great Seneca Highway and Twin Lakes Drive. Forest impacts at this station are approximately two acres. As mentioned above, this area is also slated for development, which will all but eliminate the habitat following construction. The COMSAT station will impact a small upland deciduous forest and old field habitat on the COMSAT property. The three-acre woodlot is relatively isolated and likely provides habitat for edge-loving species of wildlife.

Proposed Transitway Yard/Shop Facilities

Proposed transitway yard/shop facilities generally have a larger footprint than stations and will impact broader areas of habitat. **Table III-54** provides a comparison of potential forest impacts associated with each yard/shop facility site at each location. The yard/shop facility sites under investigation at the Shady Grove Metro station occur on mostly developed land. No significant impact is anticipated at this location. Proposed yard/shop facility sites just northeast of the Metropolitan Grove Metro Station occur within mostly forested habitat. These sites will impact between 14 and 20 acres of forest within a large, contiguous upland deciduous forest. As mentioned with respect to the transitway alignment through this area, impacts to this forest will reduce the suitability of the area for sensitive FIDS species as well as reduce the area available for other wildlife species. Forest impacts associated with the COMSAT yard/shop facility sites ranges from two to nearly 21 acres. These impacts are to both upland and wetland forest adjacent to a tributary of Little Seneca Creek. Some of the potential sites will also result in impacts to adjacent old field habitat on the COMSAT property. These impacts will displace many individual birds and other wildlife, but will likely not result in local losses of species because of

the availability of similar habitat immediately adjacent to the site. While all originally proposed yard/shop facility sites were assessed for potential impacts to habitat and wildlife, several sites have already been removed from further consideration for various reasons. These include Shady Grove site 2, Metropolitan Grove site 1-3, and COMSAT sites 1 and 3. Removal from further consideration of Metropolitan Grove site 1-3 eliminates the potential impact of approximately 20 acres of forest habitat. Similarly, removal from consideration of COMSAT sites 1 and 3 eliminates the potential impact of approximately 23 acres.

TABLE III-54
COMPARISON OF TERRESTRIAL FOREST IMPACTS FOR THE TRANSITWAY YARD/SHOP FACILITIES (ACRES)

Yard/Shop Facility Location	Impact (Acres)
Shady Grove	
Site 1	0.5
Site 2[1]	0
Site 3	1.1
Site 4	0
Site 5	0
Metropolitan Grove	
Site 1-3[1]	19.9
Site 2A	14.4
Site 4-5	14.2
COMSAT	
Site 1[1]	20.9
Site 2	8.2
Site 3[1]	2.0
Site 4	9.1

[1] *Sites have been eliminated from further consideration.*

Alternate 5A/B/C

Alternate 5A/B/C is the Enhanced Master Plan HOV/General-Purpose alternate. It differs from Alternates 3A/B and 4A/B by the inclusion of both an HOV and general-purpose lane in each direction along I-270 between MD 121 and I-70. Alternate 5C includes the addition of direct access ramps at I-370, MD 118, and MD 85/Shockley Drive. Like the previous two alternates Alternate 5A includes LRT and Alternate 5B includes BRT transitway options. However, instead of a transitway alignment, Alternate 5C includes a premium express busway that will use the direct access HOV lanes along the highway alignment.

Highway Alignment

Between I-370 and MD 121 highway improvements under Alternate 5A/B/C are the same as those for Alternates 3A/B and 4A/B. Therefore, potential effects are also the same. Between MD 121 and I-70 Alternate 5A/B/C will include one additional lane in either direction compared to Alternates 3A/B and 4A/B. The additional lanes are proposed to the outside of the existing roadway creating encroachment effects on terrestrial habitats. As discussed above, encroachment effects disturb habitats but do not create large impacts where no impacts previously existed such

as would be the case if a new roadway were being constructed through previously undisturbed habitat. Potential forested impacts associated with Alternate 5A and 5B total 172 acres. This is slightly higher than impacts estimated for Alternates 3A/B and 4A/B because of the lane expansion to the outside of the existing roadway between MD 121 and Shockley Drive. Between Shockley Drive and I-70 the additional lanes will be accommodated within the same outside right-of-way as that proposed for Alternates 3A/B and 4A/B by adding lanes within the median. As a result of the direct access lanes at the three interchanges described above, Alternate 5C will impact approximately 180 acres of forest habitat. The direct access ramps at I-370 will extend the HOV lanes from the median of I-270 to and from I-370 as well as a new general-purpose lane from westbound I-370 to northbound I-270. These lanes will be added to the north of the existing ramp from westbound I-370 to northbound I-270. Forest impacts in this location will occur to the floodplain of Muddy Branch. This upland deciduous forest is an important natural corridor in an otherwise developed landscape, providing habitat for a range of wildlife species adapted to living within urban centers. The direct access ramps to the remaining interchanges are within the median of existing I-270 and will not result in impacts to terrestrial habitat or wildlife.

Transitway Alignment

The proposed transitway alignment included in Alternates 5A/B is the same as that proposed under Alternates 3A/B and 4A/B. Therefore, the proposed transitway alignment under Alternates 5A/B will have the same potential impact to forest habitat (27 acres) as was described for Alternates 3A/B and 4A/B.

Proposed Transitway Yard/Shop Facilities

The proposed transitway yard/shop facilities are the same as those proposed for Alternates 3A/B and 4A/B. Therefore, the potential impacts to terrestrial habitat and wildlife are also the same as proposed for Alternates 3A/B and 4A/B.

c. Mitigation

Forest resources are protected through the state Forest Conservation Act and Reforestation Law Natural Resource Article 5-103 for state funded projects. The law requires that transportation projects cut or clear only the minimum number of trees and other woody plants as necessary and that is consistent with sound design practices. The law also requires reforestation at a 1:1 ratio if forest impacts total an acre or more. The reforestation lands must be on state-owned land or other publicly owned land. Several reforestation options in the following order may be used to meet the requirements of the Reforestation Law and include:

- Reforestation on-site in the project right-of-way
- Reforestation on public land within the county and subwatershed in which construction occurred
- Reforestation within the county or subwatershed within the state in which construction occurred
- Payment into the Reforestation Law fund in the amount of $4,356 per acre deforested

The selection of an alternative that has the least habitat loss for wildlife species would result in avoidance or minimization of adverse impacts. These avoidance and minimization measures will be assessed during final design. Stormwater management practices that minimize the discharge of sediment or environmental contaminants would help protect sensitive habitats. Choosing alignments that skirt the edges of the habitat rather than split the habitat into two smaller fragments can minimize the effects of habitat fragmentation. The inclusion of adjacent floodplains in the crossing of streams by bridges and culverts will provide travel corridors for wildlife and allow connectivity between habitats.

2. Aquatic Habitat

a. Existing Conditions

Perennial and intermittent non-tidal streams provide most of the aquatic habitat throughout the I-270/US 15 Corridor. Non-tidal waters are restricted to both modified/natural stream channels and ponds. Farm ponds become more prevalent as the I-270/US 15 Corridor extends north into Frederick County and land use shifts to agriculture.

The non-tidal streams throughout the study area are host to several freshwater species that can be categorized as aquatic macro-invertebrates. Aquatic macro-invertebrates include insects, worms, mollusks, crustaceans, and other organisms that live in freshwater habitats. This diverse community of organisms, especially benthic (bottom-dwelling) forms, are good indicators of localized water quality conditions because many macro-invertebrates have limited migration

patterns and include species that have a broad range of trophic and pollution tolerances. Site specific impacts and cumulative effects on surface water quality can be assessed through the changes in composition and structure of the macroinvertebrate community.

The quality and quantity of in-stream and riparian habitat affect both the structure and composition of resident biological communities. The documentation of general land use; description of the stream origin and type; summary of the riparian vegetation features; and measurements of in-stream parameters such as width, depth, flow, and substrate are imperative to understanding the health of an aquatic community.

Aquatic macroinvertebrate sampling in combination with physical habitat assessment has been conducted by DNR, MDE, DEP, and the Save Our Streams organization for streams throughout both Montgomery and Frederick counties. The DEP has collected data for Muddy Branch, Gunners Branch Great Seneca Creek, Wildcat Branch, Little Seneca Creek, and Upper Ten Mile Creek. The County's baseline stream monitoring program has developed an Index of Biological Integrity (IBI) that is comprised of measurements, or metrics, of the fish and aquatic insect community found in the County's highest quality, least impaired streams. Biological integrity is defined as "the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the best natural habitats within a region" (Karr and Dudley 1957). A scoring criteria table is used to organize measurements of fish and aquatic insect community metrics, which are used to transform calculated biological community metric values into comparative scores that can be summed. The summed scores from baseline stream monitoring stations are compared to the full range of summed scores found among the reference streams and incorporated into Biological Integrity Classes. The classes are four narratives (excellent, good, fair, or poor) that signify a further departure from the highest quality reference condition found among the reference streams. **Table III-55** contains descriptions of Biological Integrity Classes and relative IBI scores based on the Montgomery County protocols. Habitat trends and physical habitat assessments were examined to confirm resource condition trends for each stream and watershed. The relationship between habitat scores and IBI scores are synonymous, with high habitat scores predicting high IBI scores.

Both Save our Streams and the MBSS team of DNR also uses a benthic index of biological integrity, such as those described in EPA's Rapid Bioassessment Protocols to develop an IBI for streams in both Montgomery and Frederick counties. The protocol compares benthic assemblages at each site to those found at minimally impacted reference sites and uses a Hilsenhoff Biotic Index that evaluates the pollution tolerance of benthic macro-invertebrates, especially their tolerance to organic pollution. **Table III-56** contains narrative descriptions of stream biological integrity associated with each of the IBI scores used in the EPA Rapid Bioassessment Protocols. A tolerance value of 0 to 10 is assigned to each taxon collected. The Index is calculated as an average tolerance value for the assemblage weighted by the abundance of each taxon.

TABLE III-55
BIOLOGICAL INTEGRITY CLASSES FOR MONTGOMERY COUNTY'S DEPARTMENT OF ENVIRONMENTAL PROTECTION STREAM PROTOCOLS

IBI Score	Narrative Integrity Class	Characteristics
46 to 50	Excellent	Comparable to the biological community found in reference streams. Exceptional assemblage of species with a balanced community composition.
34 to 45	Good	Decreased number of sensitive species, decreased number of specialized feeding groups some intolerant species present.
22 to 33	Fair	Intolerant and sensitive species are largely absent; unbalanced feed group structure.
10 to 21	Poor	Top carnivores and many expected species absent or rare; general feeder and tolerant species dominant.

Source: *Plafkin et al. 1989 and Karr et al. 1986, Ohio EPA 1987.*

TABLE III-56
NARRATIVE DESCRIPTIONS OF STREAM BIOLOGICAL INTEGRITY ASSOCIATED WITH EACH OF THE IBI SCORES FOR US EPA RAPID BIOASSESSMENT PROTOCOLS

IBI Score	Narrative Integrity Class	Characteristics
4.0-5.0	Good	Comparable to reference streams considered to be minimally impacted. Fall within upper 50% 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 these minimally impacted streams. Fall within the lower portion of the range of reference sites (10^{th} to 50^{th} percentile).
2.0-2.9	Poor	Significant deviation from reference conditions, with many aspects of biological integrity not resembling the qualities of these minimally impacted streams, indicating some degradation.
1.0-1.9	Very Poor	Strong deviation from reference conditions, with most aspects of biological integrity not resembling the qualities of these minimally impacted streams, indicating severe degradation.

Source: *Barbour et al. 1999.*

The MBSS adopted a scale by Bode and Novak that includes four categories ranging from non-impacted to severely impacted. For the sampling that occurred from 1995 to 1997, these four categories were used with narrative ratings assigned as follows:

- Scores of 0 to 4.5 are rated good
- Scores of 4.51 to 6.5 are rated fair
- Scores of 6.51 to 8.5 are rated poor
- Scores of 8.51 to 10.0 are rated very poor

The physical habitat is also assessed with an index (PHI) but is not summed with the benthic IBI score for an overall rating. Four individual physical habitat metrics were determined to be

important in discriminating reference sites from degraded sites: in-stream habitat, structure, velocity/depth diversity, embeddedness, and aesthetic quality. Four categories similar to those used for benthic IBI were established as follows:

- Scores of 72 to 100 are rated good
- Scores of 42 to 71.9 are rated fair
- Scores of 12 to 41.9 are rated poor
- Scores of 0 to 11.9 are rated very poor

The habitat conditions for the sections of streams crossed by the I-270/US 15 Corridor are relatively the same. Stations located within the upper portions of Muddy Branch are rated fair for both biological integrity and habitat condition because the stream channel is incised and bank stability is poor. Sediment deposition and embeddedness of the channel substrate can be attributed to high levels of imperviousness in and around the riparian buffer of the stream. The MBSS sampling stations downstream of I-270 exhibited a PHI of 68 and an IBI of 2.56, which represents a fair rating for both the habitat and benthic community. Most likely the cause of impairment in this portion of Muddy Branch is related to habitat alteration.

The I-270/US 15 Corridor bisects the headwaters of Upper Long Draught and Gunners Branch, which are tributaries to Great Seneca Creek. Both the DEP and MBSS rated the headwaters of these streams as fair for both habitat and biological integrity. High-density areas in Gaithersburg, including commercial areas and the National Institute of Standards and Technology drain to these streams. Many of these areas do not have on-site runoff controls, as regional controls were widely used when the area was developed. The sedimentation of these tributaries, as well as the extensive clearing along the right-of-way for I-270 has contributed to the fair rating for Great Seneca Creek. Overall, the Great Seneca Creek is rated good due to the contiguous forested buffers that surround this stream, however areas near MD 355 and I-270 have caused substantial disruption to the buffer. Wildcat Branch is the only tributary to Great Seneca Creek that received an excellent rating for biological integrity and a rating of good for habitat conditions because low-density land uses predominate. A tributary of Wildcat Branch flows within the median strip of I-270. This tributary is presently experiencing some bank erosion and sediment deposition.

Portions of Little Seneca Creek, Little Bennett Creek, and Upper Ten Mile Creek have been influenced by a fracture fault line, which runs through these watersheds. These fault lines have influenced the channel morphology significantly, creating an environment that supports a diverse and sensitive benthic macroinvertebrate community. The Hilsenhoff Index for both Ten Mile Creek and Little Seneca Creek were between 4 and 5, which shows an unimpaired, pollution-sensitive, macroinvertebrate community. Samples taken from the MBSS stations upstream of the I-270 roadway exhibited excellent to good ratings for both biological integrity and habitat conditions.

Samples taken from MBSS stations located just upstream of the I-270 roadway from Bennett Creek exhibited a high score for PHI and fair scores for IBI and the Hilsenhoff Index. This indicates impairment to the macroinvertebrate community either through chemical input to the stream or altered flow. The DEP designated this portion of Bennett Creek as good for both

biological integrity and habitat conditions. However, reconnaissance of the upper watershed revealed areas of deeply entrenched channels in the headwaters.

Macroinvertebrate sampling and habitat assessments were not conducted for Rock Creek, Carroll Creek, and Muddy Run within the I-270/US 15 Corridor in Frederick County. (There is no explanation as to why habitat assessments were not conducted for the streams specified. The agencies do not explain their rationale as to why they choose certain streams for sampling.) The available data from MBSS was collected and reviewed for portions of the I-270/US 15 Corridor that crosses Tuscarora Creek, and Monocacy River. The Tuscarora Creek station is situated west of US 15 near Charlesville. Samples taken from this station exhibited scores that were rated poor for both biological integrity and habitat conditions. The Hilsenhoff Index was rated fair, indicating that the possible cause of impairment could be habitat degradation or nutrient enrichment. Most of the forested buffer along Tuscarora Creek has long since been removed for agricultural purposes. Sampling stations on a tributary to the Monocacy River situated north of the project area displayed fair ratings for biological integrity, habitat conditions, and the Hilsenhoff index. The possible cause of impairment is the alteration of the buffers along this stream due to the encroachment of agricultural areas and intense development.

The Project Team conducted macroinvertebrate sampling in Fall 2000 using EPA's Rapid Bioassessment Protocols for portions of the Monocacy River located upstream and downstream of I-270. These samples exhibited fair ratings for biological integrity and habitat conditions. A dominance of species intolerant of pollution, such as mayflies and caddisflies, were collected in both areas of the Monocacy River. However, species diversity was limited throughout the samples, lowering the overall biological integrity score. Black fly larvae and beetle species were dominant in the upstream samples of the Monocacy. These pollution tolerant species indicate an overall imbalance in the community, indicating a chemical or altered flow impairment within the stream. During the site visit, a sewer line was observed within the sampling reach and a sewer gas smell was evident.

Fisheries

The DNR, MDE, and Montgomery County Department of Environmental Protection (DEP) were contacted for existing data on fisheries. Available data from the MBSS for streams within the I-270/US 15 Corridor were reviewed for years 1994 through 1997. Random sampling of fish occurred during the summer period using electrofishing methods within 75-meter stream segments at pre-selected stations throughout Montgomery and Frederick counties. Captured fish were identified to species, if possible, counted, and examined for visible external pathologies or other anomalies. The Montgomery County DEP has collected data from over 200 monitoring stations throughout the county in which fish were sampled during the summer and fall of 1997 and 1998. Supplemental data from MDE for streams within Frederick County that would be impacted by highway and transitway improvements to the I-270/US 15 Corridor were also examined.

Most of the streams designated as Use I throughout the highway and transitway alignments support a warm-water fish community. The most abundant fish species collected within this type of community were American eel (*Anguilla rostrata*), blacknose dace (*Rhinichthys atratulus*),

bluntnose minnow (*Pimephales natatus*), creek chub (*Semotilus atromaculatus*), fantail darter (*Etheostoma flabellare*), greenside darter (*Etheostoma blennioides*), largemouth bass (*Micropterus salmoides*), Potomac sculpin (*Cottus girardi*), redbreast sunfish (*Lepomis auritus*), swallow-tail shiner (*Notropis procne*), white sucker (*Catostomus commersoni*), and yellow bullhead (*Ameiurus natalis*). These freshwater species spend most of the year in non-tidal freshwater areas, but many migrate downstream in winter months. The largemouth bass is the only semianadromous species that lives in estuarine waters and spawns in freshwater. Catadromous species such as the American eel inhabit freshwater during adult life stages but spawn in coastal waters of higher salinity.

The creek chub, white sucker, and yellow bullhead are pollution tolerant species that are adapted to a wide range of conditions. Several of these species were collected in the headwaters of Muddy Branch, Long Draught Branch, Gunners Branch, and along tributaries within the cleared right-of-way of I-270, where turbid, slow-moving conditions are prevalent due to the intensely developed and impervious areas that surround these stream systems within the City of Gaithersburg. Mixed uses and high densities adjacent to I-270, the proposed transitway alignment, and other proposed transportation facilities have detrimentally impacted riparian buffers causing a decrease in available habitat for fish.

The I-270 Corridor also crosses Little Seneca Creek, Little Bennett Creek and its tributaries, and Bennett Creek where some of the most diverse cold-water fish communities reside. Little Seneca Creek is designated as recreational trout waters in the vicinity of the I-270 highway and transitway alignment, while Little Bennett and tributaries support wild trout populations above MD 355. An abundance of blacknose dace, brown trout, mottled sculpin, Potomac sculpin, and rainbow trout were collected at monitoring stations located near I-270 within Soper's Branch and Little Seneca Creek. Brown and rainbow trout usually spawn upstream in areas where ample current and clean gravel substrates are available. Several of these cold-water species are sensitive to fluctuations in temperature and dissolved oxygen levels, which are heavily influenced by the surrounding land use. The riparian buffer of these stream systems is comprised of large forested tracts, which have been preserved or protected through stream valley park acquisition. Removal or encroachment of the buffer through development could severely alter the in-stream conditions needed to support a cold-water fish community.

Cold-water fish communities also exist within the northern portions of the Corridor highway alignment at the US 15 crossing of Carroll and Tuscarora Creeks. Carroll Creek is designated as a Put-and-Take Youth/Blind Trout Fishing Area, in which adult brown and rainbow trout are stocked during the spring and fall months. Sampling conducted by DNR within the portion of Carroll Creek that extends from US 15 upstream to Shookstown Road recovered 28 brown trout and 12 rainbow trout, indicating movement by both species out of the stocked areas. Native brook trout have also been located in portions of Tuscarora Creek located upstream of US 15. Maintaining cool water temperatures and protection from silt and sedimentation is crucial to native trout populations.

US 15 crosses several warm-water streams that include a tributary to the Monocacy River, Quarry Branch, Arundel Branch, portions of Tuscarora Creek, and Muddy Run. Most of these streams were not sampled for fish, however sampling did occur in the Monocacy River in 1997.

Many species that are found in the Monocacy would be expected to occur in these streams as well due to the short distance between where US 15 crosses these tributaries and their confluence with the Monocacy River. The types of species sampled included carp (*Cyprinus carpio*), common shiner (*Notropis amoenus*), spottail shiner (*Notropis hudsonius*), swallowtail shiner, rosyface shiner (*Notropis rubellus*), spotfin shiner (*Notropis spilopterus*), bluntnose minnow, white sucker, northern hog sucker (*Hypentelium nigricans*), golden redhorse (*Moxostoma erythrurum*), rock bass (*Ambloplites rupestris*), bluegill (*Lepomis macrochirus*), smallmouth bass (*Micropterus dolomieui*), largemouth bass, and tesslated darter (*Etheostoma olmstedi*).

b. Impacts and Mitigation

Long-term impacts to aquatic habitat are not anticipated for the No-Build, TSM/TDM alternate or build alternates. Short-term construction effects from bridge and culvert extensions could temporarily displace macroinvertebrate and fish populations as increased sediment loads enter the stream. Excessive sediment can reduce the available substrate for benthic colonization and fish refugia. Turbid water conditions generated from the construction phases of the build alternates could potentially suffocate "pollution sensitive" species. However, most of the construction for bridge extensions is occurring in portions of the stream that are currently disturbed by the existing crossing. Assemblages of pollution tolerant species are more likely to occur in these areas, as the existing road has already altered in-stream habitat.

Strict adherence to sediment and erosion control measures during the build phases of the highway and transitway options are necessary, especially in Little Seneca Creek, Rock Creek, Carroll Creek, and Tuscarora Creek. These streams harbor some of the most diverse cold-water fish communities comprised primarily of trout. These species are particularly sensitive to fluctuation in temperature and dissolved oxygen levels. An influx of sediment downstream of the alignments could reduce available levels of dissolved oxygen. Selective clearing rather than clear-cutting of woody vegetation is needed to retain portions of the buffer for shading to maintain cooler water temperatures.

The proposed transit stations and yard/shop facility sites could have long-term impacts to aquatic habitat and species. The facilities will provide additional areas of impervious surfaces that will increase surface runoff and potential pollutants being delivered to streams within the project corridor. Surface runoff is frequently warmed as it flows over hot paved surfaces or through stormwater ponds. Thermal stressors can significantly alter the structure of a stream's biological community by reducing diversity and sensitive species composition. The yard/shop facilities at Metropolitan Grove Station and COMSAT Station would permanently displace and destroy in-stream habitat and macro-invertebrate populations. These sites are on tributaries to Great Seneca Creek and Little Seneca Creek, which contain unimpaired, pollution-sensitive, macroinvertebrate communities. Piping these tributaries to accommodate a concrete pad for the yard/shop facilities would remove the channel substrate. More pollution-tolerant species, such as black fly larvae and beetle species, would migrate to these areas, reducing species diversity. Extensive clearing would be required in undisturbed, forested riparian buffers. Removal of the stream buffers would increase water temperatures, making in-stream conditions more suitable for warm-water fish communities. These communities are comprised of pollution tolerant species that are

adaptable to a wide range of conditions. These species include creek chub, white sucker, and yellow bullhead.

Chemical impairment to an aquatic community could occur in streams adjacent to proposed highway and transitway facilities. The introduction of pollutants such as particulates, petroleum based fuels, metals, deicing salts and other contaminants that typically accumulate on road surfaces and become mobilized during rain events could be deposited into adjacent streams. Impacts to aquatic habitat and species would include limited species diversity due to the migration of more pollution tolerant species.

The implementation of BMPs for both sediment and erosion control and stormwater management will reduce pollutant loads and control runoff. Stormwater runoff would be managed under the updated MDE Stormwater Management Regulations and would be in compliance with COMAR 26.09.02 Stormwater Management Practices under these regulations, including: on-site infiltration, flow attenuation by open vegetated swales and natural depressions, stormwater retention structures, and stormwater detention structures.

3. Rare, Threatened or Endangered Species

a. Existing Conditions

Rare, threatened, or endangered (RTE) species are regulated at the federal level under Section 7 of the Endangered Species Act. At the state level, RTE species are regulated under the Maryland Non-game and Endangered Species Act. The USFWS and the DNR were contacted regarding the potential presence of RTE species within the project area. According to the USFWS database, there are no federally proposed or listed endangered or threatened species known to occur within the I-270/US 15 highway and transitway alignments, or other facilities associated with the highway or transitway areas. The DNR Natural Heritage database indicates that there are records for species of concern that have been known to occur on or immediately adjacent to the overall project area or within approximately one mile of the project area.

RTE species listed within the overall I-270/US 15 Corridor highway and transitway alignments fall on five quadrangle maps including Rockville, Gaithersburg, Germantown, Urbana, and Frederick. The data are sorted by species known to occur on or immediately adjacent to the Corridor and species known to occur within one mile of the project. Only those species known to occur on or immediately adjacent to the project are described.

State Listed Species Known to Occur on or Immediately Adjacent to the Project

State listed threatened species known to occur on or immediately adjacent to the project area include sedge wren (*Cistothorus platensis*), Canadian burnet (*Sanguisorba canadensis*), swamp-oats (*Sphenopholis* pensylvanica), and Buxbaum's sedge (*Carex buxbaumii*).

Sedge wren is known to have bred historically within the headwaters of Watts Creek in Montgomery County (Rockville Quad). Within the project limits, the headwater areas of Watts Creek occur on the King Farm. This property is presently under construction as a mixed-use development including office complexes and residential units. The transitway alignment is

proposed to follow a newly constructed road through this property. The Canadian burnet, swamp-oats, and Buxbaum's sedge all were known to occur within a wetland designated as a Nontidal Wetland of Special State Concern by MDE. This wetland is known as the Germantown Bog and occurs in an unnamed tributary to Little Seneca Creek. The wetland lies outside the study area north of I-270, just south of the Father Hurley Boulevard interchange in Montgomery County (Germantown Quad).

b. Impacts and Mitigation

The USFWS has indicated that except for occasional transient individuals, no federally proposed or listed endangered or threatened species are known to occur within the project impact area. The DNR response letter documented the presence of RTE species immediately adjacent to the project impact area. These species include sedge wren, Canada burnet, swamp-oats, and Buxbaum's sedge. The three plant species are associated with the Germantown Bog, a state designated wetland of special state concern. This wetland is located just south of the Father Hurley Boulevard interchange and approximately 400 feet east of the proposed right-of-way for Alternates 3A/B, 4A/B, and 5A/B/C. The wetland is associated with an unnamed tributary of Little Seneca Creek that drains west across the I-270 Corridor. Alternates 3A/B, 4A/B, and 5A/B/C impact a wetland downstream of the wetland of special state concern. During field investigations for the I-270 corridor project none of these species were identified within this wetland. Therefore, no impacts to these state listed species are anticipated.

According to a letter from DNR dated March 5, 2001 providing supporting information on possible RTE species within the project area, there are no recent sedge wren records within the project area. A copy of this letter is included in the Comments and Coordination section of this document. In the early 1990s, the species was known to breed within the headwaters of Watts Creek. The King Farm property lies within the headwaters of Watts Creek. The proposed transitway alignment extends through this property, which is presently being developed as a corporate park. The DNR letter states that the area has undergone considerable recent development, and that it is unknown whether this species is still attempting to breed in this general vicinity. The corporate development has impacted most of the emergent wetland areas on the King Farm property preferred by this species. Regardless of the potential presence of this species, the proposed project will not impact sedge wren habitat. The proposed transitway alignment will follow existing roadways through this area and the highway alignment is outside the known area of sedge wren occurrence. No other state listed species are known to occur within the project impact area.