

4.0 AFFECTED PHYSICAL ENVIRONMENT AND CONSEQUENCES

This section combines the description of the affected physical environment with a discussion of the potential consequences of the project in relation to physiography, climate and air quality, floodplains and water resources, wetlands, soils, terrestrial and aquatic habitats, and rare, threatened or endangered species. The purpose of this format is twofold: first, it serves to eliminate the repetition of information that is common when these sections are separate; second, a description of the existing conditions of each parameter immediately followed by a discussion of the associated corridor involvements, provides a more comprehensive understanding of the environmental consequences of the proposed action. The general format for each parameter studied includes a brief, introductory description of the physical parameters, followed by an explanation of the methodology used to analyze that parameter. After methodology, a description of the affected environments, and discussions of potential direct impacts, and potential secondary and cumulative impacts are provided. Each parameter analysis is concluded with a discussion of mitigation measures that will help to avoid or minimize impacts resulting from implementation of the project.

4.1 PHYSIOGRAPHY

Physiography includes a description of selected topography and landform features. Portions of the middle New River basin and all project alternatives lie within a physiographic region known as the Appalachian Plateau. This region is a plateau that has been deeply dissected, over a long time period, by rivers and streams, most notably the New River. Consequently, the topography of the area appears rough and mountainous. Much of the province is characterized by sharp ridges, narrow v-shaped valleys, occasional high, narrow plateau remnants and rolling hills (WVDNR 1983).

The most prominent physiographic feature in the basin is the New River gorge. Once a sandstone plateau, the area was carved out by the waters of the New River. The gorge is generally thought of as extending from Sandstone Falls to Gauley Bridge, where the New River joins the Gauley River (WVDNR 1983). In addition, the project study area includes the portion of the river extending south from Sandstone Falls to Hinton within the New River Gorge National River (NRGMR) boundary.

The rocks of the New River basin range in age from the Devonian Period to the Pennsylvanian Period of the Paleozoic Era. There are no known Quaternary rocks of any size in the basin. Outcrops of rocks of the older Devonian Period are found in narrow strips along East River Mountain and Peters Mountain near the basin's southern boundary. Sedimentary rocks of the Mississippian and Pennsylvanian periods dominate the geology of the New River basin (WVDNR 1976).

The project study area lies within rock formations from the Mississippian Period. The Mauch Chunk Series makes up the upper Mississippian rocks, followed by the Greenbrier Series, and thin layers of the Maccrady and Pocono series (WVDNR 1976).

Rocks of the Mauch Chunk Series are found in Mercer, Summers and western Monroe counties. The thickness ranges from 671 to 1,052 meters (2,200 to 3,450 feet). The series exhibits more variety than in other parts of the state. The sandstones of the Mauch Chunk Series may contain some limestone particles. In the upper two thirds of the series, the shales contain few organic remains. The shales in the bottom third are calcareous and marine. The limestone in the upper part of the Mauch Chunk Series is thin, impure and lenticular. A heavy bed of compact marine limestone (Avis Limestone) is found near the middle. The limestone toward the bottom of the Mauch Chunk Series becomes more massive and persistent, and is filled with fossil forms (WVDNR 1976).

Mineral Resources

Physiographic provinces reflect the general geologic conditions of the area and are a rough guide to the mineral potential. The Appalachian Physiographic Province is a good source for bituminous coal, natural gas and petroleum. Bituminous coal is produced in the New River basin, however, no minable coal beds have been found within the project study area (McColloch 1986). To date, no petroleum has been produced in the basin, however, test wells with an average depth of more than approximately 6 kilometers (4 miles) have been drilled (Avary 1982). Natural gas is also produced in the New River basin, but only to a limited extent in Fayette and Raleigh counties (Avary 1982). A dry well was drilled northwest of Hinton (USDOI 1982). According to the West Virginia Geological and Economic Survey (McColloch 1986), no high yield gas production fields occur within the project study area. Other minerals that have been produced in the basin include limestone, sandstone, sand and gravel, and clay and shale (WVDNR 1976).

There is no evidence of significant deposits of metallic minerals within the New River basin (USDOI 1982). Deposits of limestone have been found and mined in Mercer and Monroe counties, but commercial quality limestone in the project study area is too deeply buried to be economically quarried (USDOI 1982). Sandstone is found in most of the basin and is also readily available throughout the state, but no significant deposits are found within the project study area (McColloch 1986). High-silica sandstones of sufficient quality for use in glassmaking exist in several areas of the gorge, but the minable areas lie outside the project study area (USDOI 1982). Clay and shale suitable for making brick and tile are found in most of the basin, but not within the project study area (McColloch 1986). There are no minable salt rock sources within the New River basin (McColloch 1986). No adverse impacts to mineral resources in the project study area are anticipated with construction, operation and maintenance of any of the project alternatives.

Floodplains

Important physiographic elements, floodplains are defined according to geomorphic criteria as low-lying land along a stream or river, the outer limits of which may be marked by steep slopes or valley walls. Floodplains are formed by incremental erosion and deposition associated with the lateral migration of streams in their valleys (Marsh 1986). In general, floodplains are considered valuable for the beneficial role they play in the natural environment. Floodplains serve to moderate the flow of water during floods, provide water quality maintenance and act as an area for groundwater recharge. Many types of aquatic and terrestrial plants and animals find their habitats in floodplains. Archaeological and historic resources, as well as recreation sites, are often located in floodplains. From an agricultural standpoint, floodplains often contain the most fertile and productive soils because topsoil washed from upstream areas is deposited in the floodplains downstream.

The floodplain functions mentioned above generally apply in the project study area, however, the completion of the Bluestone Dam in 1952 has affected the river's flood regime and has decreased the area of functioning floodplain in the project study area (see Figures 4.1.a, 4.1.b and 4.1.c for the approximate location of the 100-year flood area).

For more information regarding flood discharge levels and the results of hydraulic studies see Section 4.3.1 Floodplains. Potential direct impacts to floodplains (i.e., the 100-year flood area) in the project study area and project compliance with 23 CFR 650 Subpart A, Location and Hydraulic Design of Encroachments on Flood Plains, are discussed in detail in Section 4.3.1.3. For additional information concerning potential impacts to floodplains see Section 4.5 Soils, Section 4.6 Terrestrial and Aquatic Habitat, and Section 5.2 Land Use.

4.1.1 Rugged Terrain and Highly Erodible Soils

Rugged terrain is categorized by steeply sloping hillslopes and mountainous areas with slopes greater than 20 percent. Much of the project study area is considered rugged terrain with the only expanse of relatively level ground found in bottomland locations and on small, isolated footslopes. Rugged terrain is characterized by potentially unstable slopes, relatively shallow soils with low moisture holding capability, relatively high surface runoff potential and poor to moderate sites for supporting vegetation. Areas of rugged terrain are a concern due to the potential impacts that the project could have on these slopes. Also, because slopes steeper than 20 percent prohibit or severely limit construction these features may effectively eliminate additional development along the proposed parkway in some locations.

In general, soils with a high potential for erosion occur on slopes greater than 20 percent are predominately found on upper reaches, hillslopes and footslopes in the project study area.

Severe erosion and sedimentation problems could occur if highly erodible, steep slopes are destabilized during project construction. Increased runoff from destabilized slopes increases the potential for localized flooding, and disturbance of terrestrial and aquatic communities.

Potential impacts to rugged terrain and highly erodible soils in the project study area include the loss of vegetation, visual disturbance from excavation work, alteration of drainage patterns, increased runoff, soil erosion, sedimentation and increased slope instability.

Stability Limitations

Stability of landform is important for road and facility construction. Areas of instability must be identified before construction to avoid potential erosion, scarring, landslides, loss of vegetation and wildlife habitat, or damage to life and property. Some active slide areas may exist within the project study area (WVDOT 1989) and further information (such as more precise data on rock and soil types, depths to bedrock, shrink-swell characteristics, etc.) will be required to verify whether slopes, soils and rock outcrops are stable enough for roadway construction where cuts are proposed. The West Virginia Department of Transportation (WVDOT), Division of Highways (DOH) will complete stability studies and provide a summary of possible unstable landforms once a preferred alternative is selected.

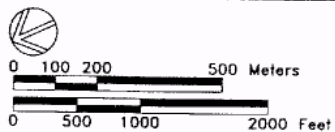
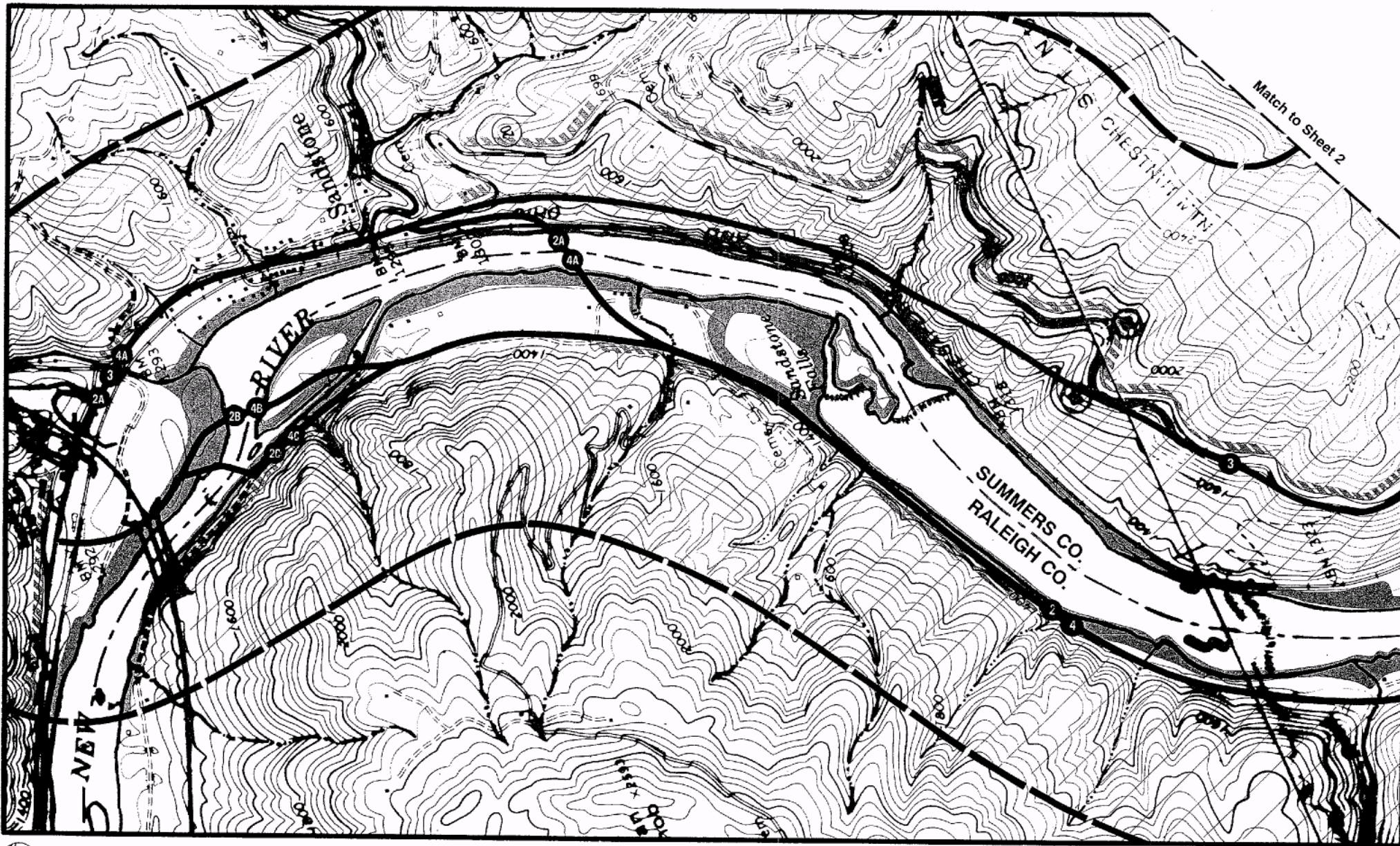
Hillslope Excavation

Project construction will require both cut and fill operations. When construction occurs in mountainous terrain with steep slopes, such operations, especially cuts, are often unavoidable. Extensive hillslope excavation is a concern due to the amount of earth which must be moved potentially resulting in erosion, scarring and loss of vegetation and wildlife habitat. Extensive hillslope excavation also increases the cost of roadway construction. Impacts resulting from hillslope excavation are discussed below and under Section 3.1.1 Visual Resources.

4.1.1.1 Methodology

Rugged terrain was mapped through slope and landform analysis performed on United States Geological Survey (USGS) topographic maps at 1:24,000 scale. Extensive and generally contiguous areas of natural slopes greater than 20 percent were mapped in this category.

The land capability classification system developed by the United States Natural Resources Conservation Service (NRCS) [formerly the US Soil Conservation Service (SCS)] was used to collect data regarding highly erodible soils within the project study area. The area contains highly erodible soils of classes IV, VI and VII with a subclass designation of "e" (the "e" designates a high risk of erosion) as identified in the soil surveys for Raleigh and Summers



100 YEAR FLOOD LEVEL



RUGGED TERRAIN (>20% SLOPE)



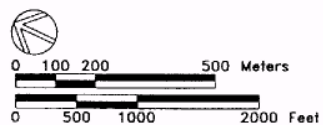
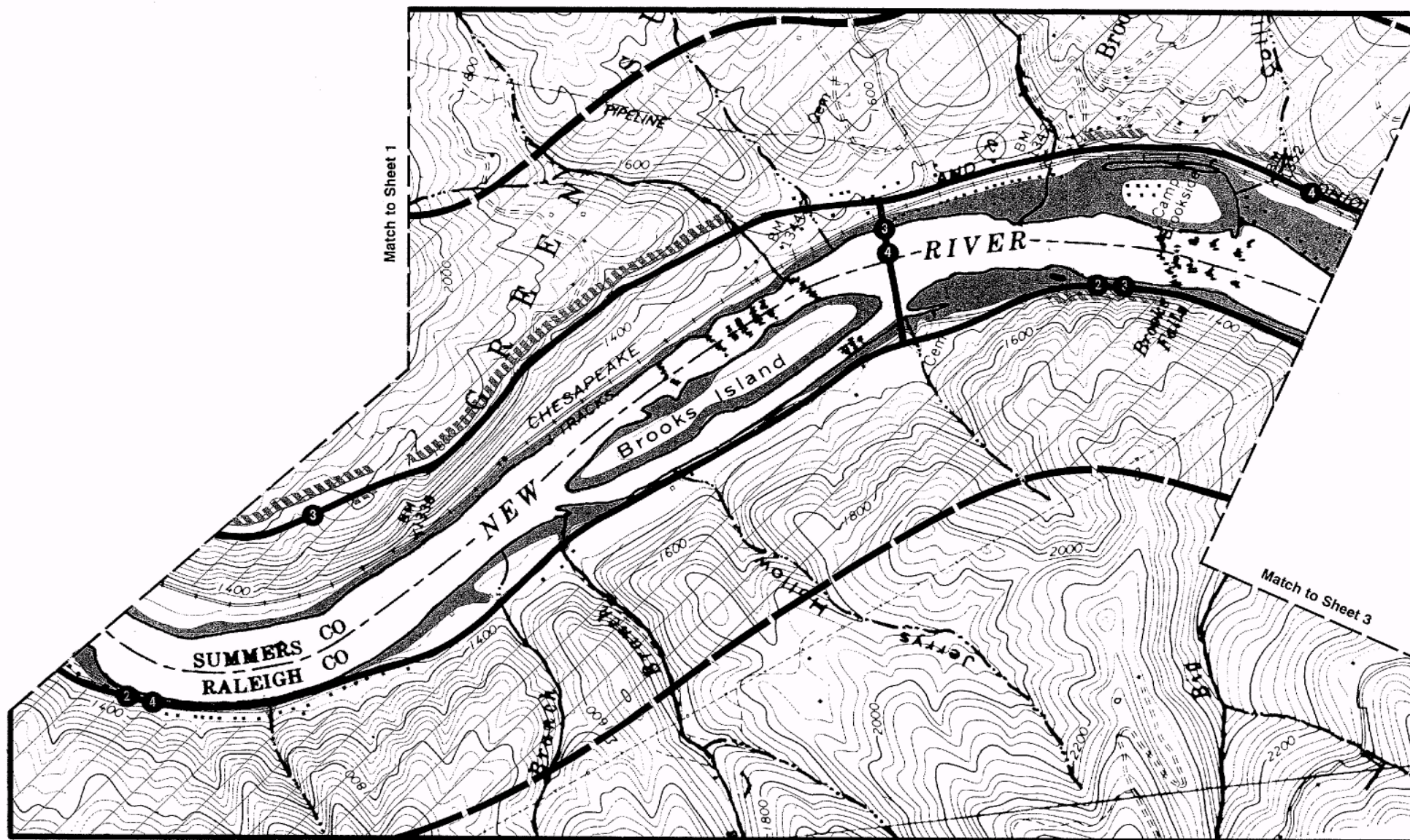
EXISTING VERTICAL CUTS

PHYSIOGRAPHY

New River Parkway
West Virginia

Northern Section

Sheet 1 Fig.4.1.8



 100 YEAR FLOOD LEVEL

 RUGGED TERRAIN (>20% SLOPE)

 EXISTING VERTICAL CUTS

PHYSIOGRAPHY

New River Parkway
West Virginia

Northern Section
Sheet 2 Fig. 4.1.

counties (USDA 1975 and 1984). In addition to these classes of soils, all areas of rugged terrain (slopes greater than 20 percent) are assumed to be highly erodible.

Estimates of impacts to rugged terrain in the project study area were obtained by reviewing 1:2,400 scale plans and 1:600 scale cross sections on drawings provided by the design engineer. All slopes exceeding 20 percent, greater than 3 meters (10 feet) in length, and falling within the estimated limits of work were evaluated as rugged terrain impacts.

4.1.1.2 Affected Environments

The physiography maps (see Figures 4.1.a, 4.1.b and 4.1.c) depict areas of rugged terrain and are assumed to be areas of highly erodible soils. Class IV, VI and VII soils with the subclass designation of "e" are mapped as highly erodible soils along with areas that have slopes greater than 20 percent. These areas include the lower shoulders of steep hillslopes along the east and west sides of the New River, and extensive upper ridges on Chestnut Mountain.

4.1.1.3 Potential Direct Impacts

The primary concern with the disturbance of rugged terrain and highly erodible soils is the potential for severe erosion due to the exposure and/or disturbance of steep slopes and unstable soils during project construction. Table 4.1.A depicts the impacts to slopes greater than 20 percent for Build Alternatives in the project study area. The No-Build Alternative is not included in Table 4.1.A as it will have no impact on slopes greater than 20 percent.

TABLE 4.1.A DIRECT IMPACTS TO RUGGED TERRAIN (SLOPES GREATER THAN 20 PERCENT) FOR BUILD ALTERNATIVES IN THE PROJECT STUDY AREA							
	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
Slopes >20% Impacted	17 ha (43 ac)	17 ha (42 ac)	18 ha (45 ac)	26 ha (65 ac)	15 ha¹(38 ac)	15 ha¹(37 ac)	16 ha¹(40 ac)
¹ Option 4D impacts 7.6 ha (19 ac) less rugged terrain compared to Alternative 4.							

In terms of rugged terrain, Alternative 3 impacts the greatest amount of land having slopes greater than 20 percent [26 hectares (65 acres)]. Option 4D impacts 7.6 hectares (19 acres) less rugged terrain compared to Alternative 4.

The most extensive area of rugged terrain that will be disturbed during project construction is located on the east side of the river on Chestnut Mountain where Alternative 3 deviates from

existing West Virginia (WV 20). The disturbed area will be approximately 2,591 meters (8,500 feet) in length. Retaining walls with heights that range from 3 to 15 meters (10 to 50 feet), and elevated bridges will be utilized to stabilize this 2,591-meter (8,500-foot) section of road as it winds around Chestnut Mountain.

Table 4.1.B depicts the earthwork estimates and associated cost estimates for Build Alternatives in the project study area based on engineering calculations of preliminary road design. Excavation volume pertains to the amount of material which must be cut or excavated during construction of the roadway while waste volume pertains to the amount of excess excavation material which must be hauled and placed as fill.

TABLE 4.1.B EARTHWORK AND ASSOCIATED COST ESTIMATES FOR BUILD ALTERNATIVES IN THE PROJECT STUDY AREA							
	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
Excavation Volume ¹	147,491 m ³ (192,910 yd ³)	122,134 m ³ (159,744 yd ³)	129,951 m ³ (169,969 yd ³)	353,121 m ³ (461,862 yd ³)	114,000 m ³ (149,105 yd ³)	88,642 m ³ (115,939 yd ³)	96,460 m ³ (126,164 yd ³)
Waste Volume ²	48,301 m ³ (63,175 yd ³)	24,854 m ³ (32,508 yd ³)	24,854 m ³ (32,508 yd ³)	185,442 m ³ (242,547 yd ³)	40,923 m ³ (53,525 yd ³)	17,476 m ³ (22,858 yd ³)	17,476 m ³ (22,858 yd ³)
Total Earthwork Costs ³	\$1,413,545	\$1,150,716	\$1,222,291	\$3,475,581	\$1,097,260	\$834,431	\$906,006
¹ Option 2D/3A will require 23,434 m ³ (30,621 yd ³) less excavation volume compared to Alternatives 2 and 3. Option 4D will require 22,849 m ³ (29,856 yd ³) less excavation volume compared to Alternative 4. ² Option 2D/3A will generate 3,367 m ³ (4,400 yd ³) less waste volume compared to Alternatives 2 and 3. Option 4D will generate 3,930 m ³ (5,135 yd ³) less waste volume compared to Alternative 4. ³ Option 2D/3A will have \$162,000 less total earthwork costs compared to Alternatives 2 and 3. Option 4D will have \$214,127 less total earthwork costs compared to Alternative 4.							

Source: WVDOT 1995b.

Table 4.1.B indicates that Alternative 3 requires the greatest amount of earthwork, Alternatives 2A, 2B, 2C and 4A require an intermediate amount of earthwork, and Alternatives 4B and 4C require the least amount of earthwork. Earthwork costs will range from a high of \$3,475,581 for Alternative 3 to a low of \$834,431 for Alternative 4B. Option 2D/3A will have \$162,000 less total earthwork costs compared to Alternatives 2 and 3 while Option 4D will have \$214,127 less total earthwork costs compared to Alternative 4. The No-Build Alternative is not included in Table 4.1.B as this project alternative requires no earthwork (WVDOT 1995b).

Higher maintenance costs will be expected for the life of the project in areas of extensive excavation or fill and in areas where retaining walls and bridges are required to cross areas of rugged terrain.

An additional concern with rugged terrain and highly erodible soils is the potential for sedimentation of streams, rivers and wetlands, and the associated lowering of water quality associated with sediment-laden site runoff. In particular, stormwater runoff generated by impervious roadway surfaces and associated project facilities over highly erodible soils could exacerbate water quality impacts downslope. Sedimentation has the potential to impact terrestrial and aquatic communities. In terms of volume, sediment is the major water pollutant in West Virginia (USDA 1993). Use of structural and vegetative erosion and sedimentation control measures during project construction are expected to minimize or eliminate such impacts in the project study area.

4.1.1.4 Potential Secondary and Cumulative Impacts

Long-term instability of slopes above and below some sections of Alternatives 2, 3 and 4 is a possible secondary impact of the new road. Rock slides, although minimized by the use of "benches," are a potential safety concern. Site runoff from disturbed areas and stormwater runoff from impervious road surfaces has the potential to undermine steep slopes and could potentially lead to erosion of hillslopes and sedimentation of the New River and nearby streams although construction techniques will reduce this concern.

The visual impact of extensive earthwork is a primary concern for Alternative 3. The existing forest on Chestnut Mountain will be split into two smaller tracks as a result of construction of new road along the side of the mountain.

4.1.1.5 Potential Mitigations

Avoidance of areas of rugged terrain and highly erodible soils through alignment alteration is the primary mitigation measure, however, alignment shifts are not feasible for most areas impacted. Thus, where rugged terrain and highly erodible soils are affected, appropriate short- and long-term erosion and sedimentation control measures which aim to minimize the extent of ground surface disturbance and reduce erosion and sedimentation will be followed.

Appropriate mitigation techniques which utilize both structural and vegetative erosion and sedimentation control measures include the provision of sediment basins, temporary diversions, sediment dams, stream bank protection, armored/rip-rap drainageways and temporary plantings during construction. Following construction, retention basins and permanent revegetation using approved plant species should be utilized to control soil erosion. Erosion control measures are

outlined in the *West Virginia Department of Transportation, Division of Highways: Erosion and Sediment Control Manual* (WVDOT 1995c).

Additional retaining walls and bridges may be used in areas of rugged terrain to minimize impacts associated with roadbuilding activities. Excavation techniques that leave vertical road cuts in a near natural appearance will be utilized whenever possible. Assuming very stable rock is found, benches in cut areas could possibly be reduced in size and the extent of cut minimized. Reclamation of disturbed areas will include the salvage of topsoil, rocks and plants, scarification and recontouring of disturbed sites, and replacement of topsoil to provide a suitable seed base, so long as disturbed areas are of suitable slope and surface type. For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.2 CLIMATE AND AIR QUALITY

The analysis of effects of the project on ambient air quality requires that contextual information be provided on climatic conditions within the project study area.

Climatic Factors

The humid, continental climate of the New River gorge area is characterized by sharp temperature contrasts, both seasonally and diurnally. Because of predominantly westerly circulation of the atmosphere in this latitude, considerable moisture is deposited on the windward slopes of the higher ridges affording a gradual increase in annual precipitation from west to east (USD A 1975).

Winter climate is mild at elevations of less than 457 meters (1,500 feet) and moderately rigorous at elevations between 457 and 914 meters (1,500 and 3,000 feet). The project study area ranges from 396 to 732 meters (1,300 to 2,400 feet) elevation. A minimum of -25° Centigrade (-13° Fahrenheit) is typical once every 10 years and -27° C (-16° F) once every 25 years. The average temperature at Bluestone Lake is 1.1 ° C (34° F) and the average daily minimum temperature is -4.4° C (24° F). Snowfall averages more than 100 centimeters (40 inches) at higher elevations, with total snowfall amounts varying greatly from winter to winter. Average snowfall at Bluestone Lake is 53 centimeters (21 inches) at an elevation of 420 meters (1,380 feet). On the average, there are 15 to 27 days with at least 2.5 centimeters (1 inch) of snow on the ground (USDA 1975 and 1984).

Summer temperatures are not extreme and are generally comfortable on the plateau areas of more than 457 meters (1,500 feet) elevation. Temperatures of 32° C (90° F) or more are unusual on the plateau areas of more than 457 meters (1,500 feet) elevation. The average temperature at Bluestone Lake is 22° C (72° F) with an average maximum daily temperature of 26° C (79° F). The highest recorded temperature at Bluestone Lake was 38° C (100° F) on July 29, 1952 (USDA 1984).

Thunderstorms occur on an average of 40 to 50 days per year and more frequently over higher elevations, predominately in June and July. Flash floods on smaller watersheds result from heavy rainfall from large area storms or intense thunderstorms. The total annual precipitation at Bluestone Lake is approximately 89 centimeters (35 inches) (see Table 4.2.A). Of this total, 60 percent usually falls during the period from April through September. The heaviest one-day rainfall during the period of record was 10 centimeters (3.94 inches) at Bluestone Lake on August 20, 1969 (USDA 1984).

TABLE 4.2.A PRECIPITATION FOR BLUESTONE LAKE, WEST VIRGINIA				
Month	Ave. Total [cm (in)]	2 years in 10 will have: less than— [cm (in)]	2 years in 10 will have: more than— [cm (in)]	Ave. Snowfall [cm (in)]
Jan	6.22 (2.45)	3.51(1.38)	8.43 (3.32)	14.22 (5.6)
Feb	6.73 (2.65)	3.25(1.28)	9.53 (3.75)	13.97(5.4)
Mar	9.12(3.59)	5.38(2.12)	12.47 (4.91)	9.91 (3.9)
Apr	7.85 (3.09)	4.93(1.94)	10.49(4.13)	0.51 (0.2)
May	9.07 (3.57)	5.36(2.11)	12.37(4.87)	0.0
Jun	7.72 (3.04)	4.60(1.81)	10.52(4.14)	0.0
Jul	9.80 (3.86)	6.27 (2.47)	13.00(5.12)	0.0
Aug	7.75 (3.05)	4.98(1.96)	10.21(4.02)	0.0
Sep	7.49 (2.95)	3.96(1.56)	10.36(4.08)	0.0
Oct	6.17(2.43)	2.51(0.99)	9.12(3.59)	0.0
Nov	5.54(2.18)	3.40(1.34)	7.42 (2.92)	0.9 (0.3)
Dec	6.58 (2.59)	3.40(1.34)	9.12 (3.59)	11.68(4.6)
Year	90.04 (35.45)	51.55 (20.30)	123.04 (48.44)	52.58 (20.70)

Source: Adapted from USDA 1984; data recorded from 1951 to 1977.

Concerns related to climate include the increased potential for flooding, erosion, sedimentation, and pollution from rainstorm events that could occur as a result of project construction.

4.2.1 Ambient Air Quality

One of the reasons people visit parks is to see and enjoy the scenery. The National Park Service (NPS) has conducted studies that examined:

- the importance of clean air as a park feature;
- the relationship between visibility conditions and satisfactory enjoyment of the park visit; and
- willingness of the visitor to expend time and/or money to obtain improved visibility conditions.

Findings suggest that visitors are aware of visibility conditions and that clean, clear air is integral to the enjoyment of visiting the parks (USDOI 1988).

In 1961, the West Virginia State Legislature passed the Air Pollution Control Law to be administered by the West Virginia Air Pollution Control Commission (APCC). Air Pollution controls in West Virginia are defined on a county-by-county basis. Major air quality goals of the APCC are the achievement and maintenance of national ambient air quality standards.

The U.S. Clean Air Act of 1977 requires that the NPS be involved in reviewing state implementation plans designed to prevent significant deterioration of air quality and to protect visibility. The NPS is also required to evaluate the effects that a new air pollution source might have on nearby park resources. The NPS has established a criteria pollutant monitoring program for the pollutants linked to effects on NPS resources. Results of this monitoring indicate that some foliar damage due to ozone was found within the NRGNR (USDOI 1988).

The New River gorge is classified under the Clean Air Act as a Class 2 area, which means that only specified levels of increase in particulate matter (PM₁₀) and sulfur dioxide (SO₂) concentrations are allowed. Pollutant levels within the gorge are in attainment of the standards and air quality in the area can be characterized as good (Michael Baker Jr., Inc. 1994).

4.2.1.1 Methodology

The primary source of air pollution emissions associated with the project are those caused by motor vehicles using the roadway system. An air quality analysis was performed following the guidelines and recommendations received from DOH, the West Virginia Division of Environmental Protection (WVDEP) and EPA, Region III.

A microscale analysis was performed in order to predict the effects of carbon monoxide (CO) changes to local air quality from the construction of the highway. The microscale analysis predicts the generation and transportation of CO in the immediate project vicinity. The years 2004 (interim year) and 2014 (design year) were analyzed and compared to the National Ambient Air Quality Standards (NAAQS). The microscale analysis was performed at the only signalized intersection in the project study area. It is located in downtown Hinton at the intersection of WV 20 (Temple Street) and 2nd Avenue. Signalized intersection areas have CO concentrations that are higher than freeflow roadside areas because vehicular queuing and idling normally generate higher emissions. Therefore, other freeflow sites in the proposed project study area will have lower predicted CO concentrations than the intersection area.

Motor vehicle emission rates were computed using EPA's MOBILE 5.0a emissions model during March 1993. The emission factors were developed with conservative model inputs. Refueling emissions were not included in any of the scenarios. CO concentrations from highway vehicles

were calculated by using CAL3QHC during June 1993, a Gaussian dispersion model and hybrid of the CALINE 3 model.

A typical worst-case approach was taken for meteorological conditions. Three-hundred and sixty wind directions were analyzed at one degree intervals to determine the maximum CO concentrations. Other factors included a wind speed of one meter (3.28 feet) per second, a neutral atmospheric condition (D), a mixing height of 1,000 meters (3,280 feet) and a worst case ambient temperature of -7° C (20° F).

Modeling was done for the peak one-hour condition. A persistence factor of 0.60 was used to convert one-hour concentrations to eight-hour concentrations. Background concentrations of 2.0 and 1.0 parts per million (ppm), for the one- and eight-hour concentrations, respectively, were used to account for CO sources outside the project study area. These values were added to the one- and eight-hour results.

Posted speeds were used for the roadways. The CAL3QHC model calculated the idle speeds and vehicular queues. Receptor sites at the intersection were chosen at locations where the highest CO concentrations could be expected and the general public had access during the analysis periods. These were placed at various representative points on adjoining property right-of-way lines. The CO concentrations were compiled to include the main roadway, cross-streets and background concentrations.

A mesoscale or "regional" analysis was not performed for the project because the project study area is in attainment for both ozone (O₃) and CO.

4.2.1.2 Affected Environments

The project study area, which includes Raleigh and Summers counties, is located within Region III of the EPA's jurisdiction. The state agencies that are normally involved with air quality in this region are WVDEP and DOH.

The Clean Air Act directed the EPA to establish standards for clean air. The EPA promulgated the NAAQS for six atmospheric pollutants: CO, O₃, Nitrogen Dioxide (NO₂), SO₂, PM₁₀ and lead (Pb). The NAAQS shown in Table 4.2.B represent levels of these pollutants and exposure periods that pose no significant threat to human health or welfare. West Virginia adheres to the same standards.

TABLE 4.2.B NATIONAL AMBIENT AIR QUALITY STANDARDS (EPA)			
Pollutant	Time of Average	Primary Standard	Secondary Standard
PM ₁₀	Annual Geometric Mean 24-Hour	75 ug/m ³ 260 ug/m ³	none 150 ug/m ³
SO ₂	Annual Arithmetic Mean 24-Hour 3-Hour	80 ug/m ³ 365 ug/m ³ none	none none 1300 ug/m ³
NO ₂	Annual Arithmetic Mean	100 ug/m ³	100 ug/m ³
CO	8-Hour	10 mg/m ³ 9 ppm	none
CO	1-Hour	40 mg/m ³ 35 ppm	none
O ₃	1-Hour	0.12 ppm 235 ug/m ³	0.12 ppm 235 ug/m ³
Pb	Quarterly Arithmetic Mean	1 .5 ppm	1.5 ppm
All standards with averaging times of 24 hours or less are not to be exceeded more than once per year. ug/m ³ = micrograms per cubic meter of air; mg/m ³ = milligrams per cubic meter of air; ppm = parts per million			

Source: USEPA, WVDEP.

Currently, air monitoring is conducted for these pollutants at various locations throughout the State of West Virginia by the National Air Monitoring System (NAMS) and State and Local Air Monitoring System (SLAMS) program. As a result of the Clean Air Act Amendment and based on historical monitoring data, all of the counties in the project study area are designated as being in attainment for CO and O₃, pollutants most normally associated with mobile source (motor vehicle) emissions.

The term attainment refers to the status of the various pollutants described in the NAAQS table previously shown. If the pollutant does not exceed the standard more than once per year, then the pollutant is considered in attainment of the standard. If the pollutant exceeds the standard two or more times during the year, then the pollutant is considered in non-attainment of the standard. When a project is designated as being within a non-attainment, it must be on an approved Transportation Improvement Plan (TIP) or meet a series of requirements in order for the project to be approved. As mentioned, the project is located in areas designated as being in attainment of the standard for CO and O₃.

4.2.1.3 Potential Direct Impacts

Construction activities can have a short-term impact on local air quality during periods of site preparation, with PM₁₀, also known as fugitive dust, having the greatest impact. This impact will occur for Build Alternatives in association with: excavation and earth moving; cement, asphalt and aggregate handling; heavy equipment operation and use of haul roads; and wind erosion of exposed areas and material storage piles. The effect of fugitive dust will be temporary and will vary in scale depending on local weather conditions, the degree of construction activity and the nature of construction activity. This effect will be minimized by requiring the contractor to adhere strictly to dust control measures as outlined in DOH's Standard Specifications, 636.4 Aggregates and Dust Palliatives.

If woody materials collected during site clearing operations are burned, then temporary, localized air pollution will be a concern within the project study area.

Microscale Analysis

Ten CO receptors were investigated and analyzed at the intersection site (see Figure 4.2.a). None of the predicted analysis sites exceeded the one-hour criteria of 35 ppm or the eight-hour criteria of 9 ppm as identified in the NAAQS. Table 4.2.C shows the predicted highest one- and eight-hour CO receptor concentrations for the existing year 1994, the interim year 2004 and the design year 2014. These receptor sites were chosen where the greatest traffic volumes were predicted, the highest CO concentrations could be expected and typical of where human activity may occur. The concentrations also included a conservative one-hour background level of 2.0 ppm and an eight-hour background level of 1.0 ppm. The highest concentrations were predicted to occur near WV 20 (Temple Street) and 2nd Avenue in downtown Hinton.

Figure 4.2.a AIR QUALITY (CO) RECEPTOR LOCATION AND IDENTIFICATION FOR DOWNTOWN HINTON, WEST VIRGINIA

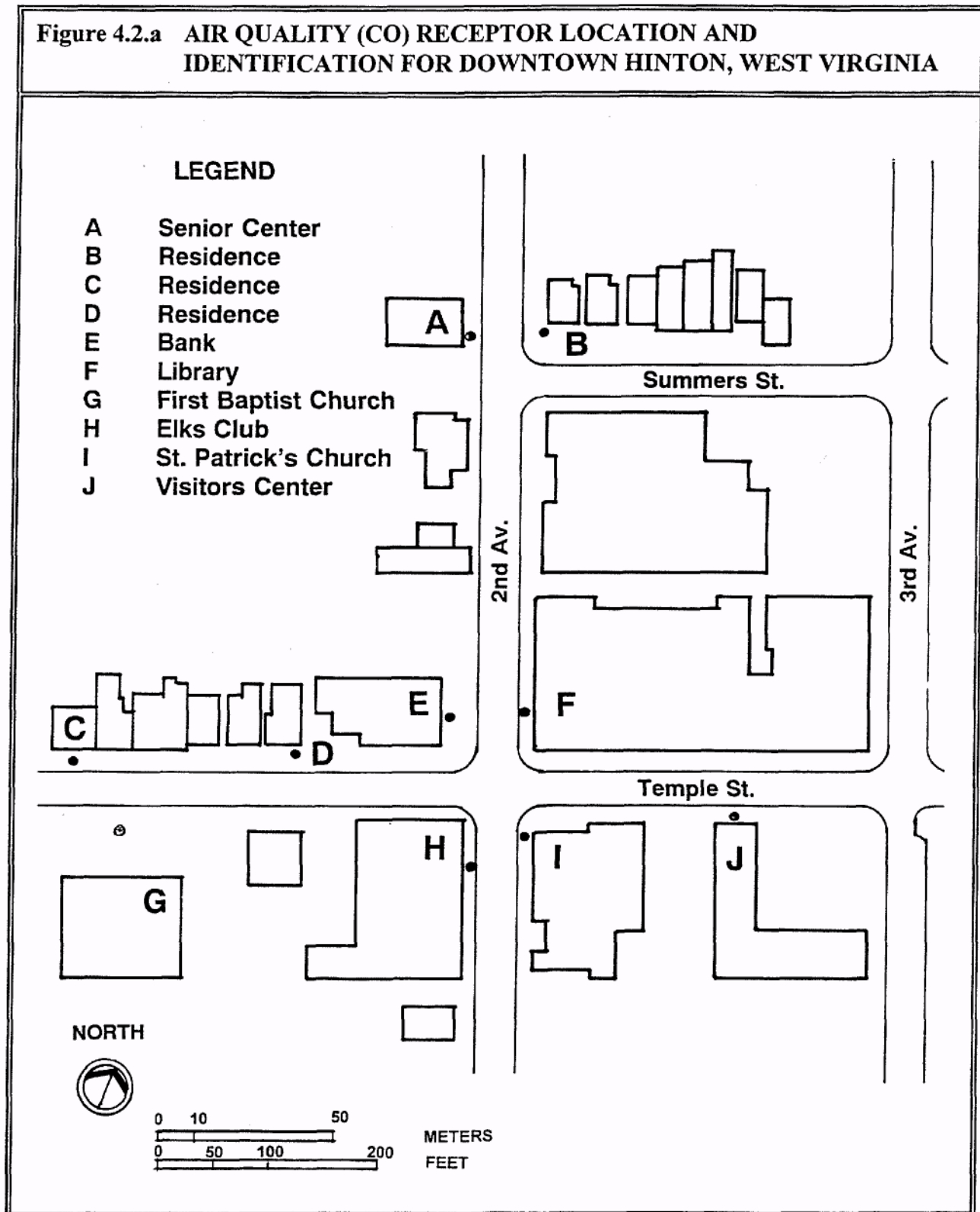


TABLE 4.2.C 1994/2004/2014 1- AND 8-HOUR PREDICTED HIGHEST CARBON MONOXIDE CONCENTRATIONS

Receptor	1994 1-Hour	2004 1-Hour			2014 1-Hour		
	Existing Year	No-Build	Alts. 2&3	Alt. 4	No-Build	Alts. 2 & 3	Alt. 4
A	2.3*	2.2	2.2	2.6	2.2	2.2	2.6
B	2.3	2.2	2.2	2.6	2.2	2.2	2.6
C	2.3	2.2	2.1	2.5	2.2	2.1	2.5
D	2.3	2.3	2.2	2.5	2.3	2.2	2.5
E	3.2	2.7	2.6	3.1	2.7	2.6	3.1
F	3.3	2.8	2.6	3.2	2.7	2.7	3.1
G	2.4	2.2	2.2	2.6	2.2	2.2	2.6
H	3.1	2.8	2.7	3.4	2.9	2.7	3.5
I	3.0	2.7	2.5	3.5	2.8	2.5	3.5
J	2.5	2.3	2.2	2.8	2.5	2.2	2.8
Receptor	1994 8-Hour	2004 8-Hour			2014 8-Hour		
A	1.2	1.1	1.1	1.4	1.1	1.1	1.4
B	1.2	1.1	1.1	1.4	1.1	1.1	1.4
C	1.2	1.1	1.1	1.3	1.1	1.1	1.3
D	1.7	1.2	1.1	1.3	1.2	1.1	1.3
E	1.7	1.4	1.4	1.7	1.4	1.4	1.7
F	1.8	1.5	1.4	1.7	1.4	1.4	1.7
G	1.7	1.1	1.1	1.4	1.1	1.1	1.4
H	1.7	1.5	1.4	1.8	1.5	1.4	1.9
I	1.6	1.4	1.3	1.9	1.4	1.3	1.9
J	1.3	1.2	1.1	1.7	1.3	1.1	1.4

* All units presented in ppm. NAAQS: 1-Hour = 35 ppm; 8-Hour = 9 ppm The predicted concentrations include a 1-hour background CO level of 2.0 ppm and an 8-hour level of 1.0 ppm.

Source: Michael Baker, Jr., Inc. 1994.

The highest predicted one- and eight-hour CO concentrations for the 1994 Existing Year Condition are 3.3 and 1.8 ppm, respectively. Based on these results, no exceedance of either the one- or eight-hour criteria is predicted to occur at any receptor for the Existing Year.

The highest predicted one- and eight-hour CO concentrations for the Year 2004 No-Build Alternative are 2.8 and 1.5 ppm, respectively. The highest predicted one- and eight-hour concentrations for the Year 2014 No-Build Alternative are 2.9 and 1.5 ppm, respectively. Based on these results, no exceedance of either the one- or eight-hour criteria is predicted to occur at any receptor for the No-Build Alternative for either year.

The highest predicted one- and eight-hour CO concentrations for the Year 2004 Alternative 4 are 3.5 and 1.9 ppm, respectively. The highest predicted one- and eight-hour concentrations for the Year 2014 Alternative 4 are 3.5 and 1.9 ppm, respectively. Based on these results, no exceedance of either the one- or eight-hour criteria is predicted to occur at any receptor for Alternative 4.

The highest predicted one- and eight-hour CO concentrations for the Year 2004 Alternatives 2 and 3 are 2.7 and 1.4 ppm, respectively. The highest predicted one- and eight-hour concentrations for the Year 2014 Alternatives 2 and 3 are 2.7 and 1.4 ppm, respectively. Based on these results, no exceedance of either the one- or eight-hour criteria is predicted to occur at any receptor for Alternatives 2 and 3.

Mesoscale Analysis

This project is in an attainment area for O₃ where the West Virginia State Implementation Plan does not contain any transportation control measures. Therefore, the conformity procedures of 23 CFR 770 do not apply.

4.2.1.4 Potential Secondary and Cumulative Impacts

Potential secondary and cumulative impacts are accounted for by the predicted increases in traffic volumes over the design-year Build Alternatives as provided by DOH. See Section 4.2.1.3 Potential Direct Impacts for more information.

4.2.1.5 Potential Mitigations

During roadway construction, all open burning will be done in accordance with all applicable laws, ordinances and regulations, and will be further subject to the applicable provisions of West Virginia's Office of Air Quality Administrative Regulations, Chapter 126-20, Series IV. Where fugitive dust is likely a problem, effective dust control measures could be implemented following

standard roadway construction procedures and best management practices for erosion and sediment control, as follows:

- minimization of exposed erodible earth area to the extent possible;
- stabilization of exposed earth with grass, mulch, pavement or other cover as early as possible;
- periodic sweeping or application of water or stabilizing agents to the working and hauling areas;
- covering, shielding or stabilizing of stockpiled material as necessary; and
- the use of covered haul trucks.

The proposed project is in an attainment area for CO. Based on the predicted results, the construction of any of the Build Alternatives will not cause an exceedance of the NAAQS for CO in any of the analysis years. The predicted CO concentrations are well below both the one- and eight-hour criteria for all conditions. Therefore, no mitigation measures are required following construction of any of the Build Alternatives as a result of the microscale analysis.

As the proposed project is in an attainment area for O₃, no mitigations are required.

For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.3 FLOODPLAINS AND WATER RESOURCES

The New River originates in the Blue Ridge Mountains near Blowing Rock, North Carolina and flows approximately 533 kilometers (331 miles) northward through Virginia into West Virginia where it merges with the Gauley River to form the Kanawha River. The New River is considered unique because it is the largest north-flowing river system and the oldest river system in North America (USDOI 1982). It also comprises one of the most important warm-water fisheries in West Virginia and has been designated a National Resource Water to be maintained, protected and improved where necessary (Water Resources Board 1990).

From the New River's headwaters in Blowing Rock to Nitro, West Virginia, the courses of the New and Kanawha rivers follow that of the ancient Teays River which began forming as the southern Appalachians rose out of an ancient ocean. Mountain uplift and subsequent erosion exposed many types of rock in the basin, most typically, shales, sandstones and limestones. On its journey through the gorge, the New River passes through an extensive area of limestone formations and gathers water from other streams that drain these calcareous lands (Sullivan 1993). Consequently, the New River is a well-buffered, biologically productive aquatic environment (WVDNR 1989).

In order to understand the potential impacts of the project on floodplains and water resources in the project study area, four factors were analyzed: floodplains, water use, water quantity and water quality. Information about wetlands and aquatic communities associated with the water resources in the project study area are discussed in Section 4.4 Wetlands and Section 4.6 Terrestrial and Aquatic Habitat. Appendix J provides information on fauna associated with terrestrial and aquatic habitat in the New River gorge.

4.3.1 Floodplains

Floodplains (i.e., the 100-year flood area depicted on Figures 4. 1a, 4.1.b and 4.1.c in Section 4.1 Physiography) are legally and administratively protected by presidential order, Executive Order (EO) 11988 Floodplain Management, which mandates that future road construction activities, recreation sites and all permanent facilities avoid floodplains.

This section provides information regarding flood discharge levels, describes the results of hydraulic studies and identifies the number of encroachments and potential impacts for each alternative on the 100-year flood area in the project study area.

In accordance with EO 11988, the FEIS will include a finding that the alignment of the preferred alternative is the only practicable alternative. Support for selection of a preferred alternative that encroaches on the 100-year flood area (if such an alternative is selected) will be consistent with

EO 11988 requirements, including: (1) the reasons why the proposed action must be located in the 100-year flood area; (2) the other alternatives considered and why they were not practicable; and (3) a statement indicating whether the action conforms to applicable State and/or local floodplain protection standards.

4.3.1.1 Methodology

The 2-year, 25-year and 100-year flood velocity and discharge data were based on information provided by Wiley and Cunningham (1994) based on data from flood insurance studies and the streamflow-gaging station at Hinton. The mapping of the 100-year flood area was based on information from Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for Raleigh County, West Virginia (Panels 84, 111 and 113). Impact areas were identified where the construction limits of project alternatives fall on or below 100-year flood elevations along the New River. Estimations of impact were made by transferring 100-year flood elevations to 1:2,400 roadway engineering plans to delineate the boundaries of impact and calculating flood area impacts from 1:600 roadway cross-sections using the double-end area method.

Representatives of the United States Army Corps of Engineers (COE) and DOH met in the field to identify Ordinary High Water (OHW) elevations along the New River in the project study area. OHW elevations were estimated to be the same as or slightly lower than annual flood elevations previously established by the COE. The COE and DOH agreed to use the more conservative elevations of the annual flood as the elevations for the OHW.

4.3.1.2 Affected Environment

Because the New River is relatively wide and most of the flow is controlled by the Bluestone Dam, discharges in the project study area are generally not expected to leave the main channel. Table 4.3.A indicates peak discharges for 2-, 25- and 100-year floods in the project study area (Wiley and Cunningham 1994). Flood velocities on the New River vary with the physical characteristics of the river; the average velocity for 2-, 25- and 100-year floods in the project study area is approximately 2.4, 2.8 and 3.1 meters per second (7.8, 9.1 and 10.2 feet per second), respectively (Wiley and Cunningham 1994).

TABLE 4.3.A PEAK DISCHARGES OF THE NEW RIVER AT SELECTED LOCATIONS IN THE PROJECT STUDY AREA				
Location	Drainage Area	Peak Discharge		
		2-year	25-year	100-year
Upstream study limit at Hinton stream-flow gaging station	16,203 km ² (6,256 mi ²)	1,529 cms (54,000 cfs)	2,294 cms (8 1,000 cfs)	3,030 cms (107, 000 cfs)
Upstream from confluence of Madam Creek	16,206 km ² (6,257 mi ²)	1,529 cms (54,000 cfs)	2,294 cms (8 1,000 cfs)	3,030 cms (107,000 cfs)
Upstream from confluence of Lick Creek	16,377 km ² (6,323 mi ²)	1,543 cms (54,500 cfs)	2,322 cms (82,000 cfs)	3, 143 cms (11 1,000 cfs)
AVERAGE	16,263 km ² (6,279 mi ²)	1,534 cms (54, 167 cfs)	2,303 cms (81,333 cfs)	3,068 cms (108,333 cfs)

Source: Wiley and Cunningham 1994.

The approximate location of the 100-year flood area in the project study area is shown on Figures 4.1.a, 4.1.b and 4.1.c. Locations where project alternatives travel in close proximity to the 100-year flood area are listed in Table 4.3.B.

TABLE 4.3.B LOCATIONS OF THE 100-YEAR FLOOD AREA PROXIMATE TO BUILD ALTERNATIVES IN THE PROJECT STUDY AREA		
	East Side	West Side
100-Year Flood Areas Proximate to Build Alternatives	• Adjacent to Camp Brookside • South of I-64 Bridge	Brooklin Along Richmond Bottom Along Brooks Island Along Long Bottom Along Sandstone Falls Across from Richmond Island

COE and WVDEP's Office of Water Resources (OWR) have regulatory jurisdiction over the area below the OHW elevation and would require permits if fill is to be placed in the river below OHW. COE would require a Section 404 permit and WVDEP-OWR would need to issue a State 401 Certification. Table 4.3.C indicates OHW elevations of the New River in the project study area.

TABLE 4.3.C ORDINARY HIGH WATER ELEVATIONS OF THE NEW RIVER IN THE PROJECT STUDY AREA		
River Mile	Streambed Elevation (Approximate)	Ordinary High Water Elevations
62.00 ¹	411.5m (1,350.0ft)	413.5m (1,356.5ft)
61.00	408.4 m (1,340.0ft)	410.6m (1,347.0ft)
60.00	405.2 m (1,329.5 ft)	407.4 m (1,336.5 ft)
59.00	402.0 m (1,319.0ft)	404.3m (1,326.5ft)
58.00	399.0 m (1,309.0 ft)	401.1 m (1,316.0ft)
57.00	396.0 m (1,299.0ft)	398.2 m (1,306.5ft)
56.00	392.6 m (1,288.0ft)	395.0 m (1,296.0ft)
55.00	389.4 m (1,277.5ft)	392.0 m (1,286.0 ft)
54.00	386.3 m (1,267.5 ft)	388.8m (1,275.5 ft)
53.00	383.1 m (1,257.0ft)	385.7m (1,265.5 ft)
52.80 ²	382.7m (1,255.5ft)	385.1 m (1,263.5ft)
¹ River Mile 62.00 is approximately 579 meters (1,900 feet) downstream of the WV 20 Bridge Crossing the New River at Hinton. ² River Mile 52.80 is the approximate point where Lick Creek enters the New River.		

4.3.1.3 Potential Direct Impacts

In compliance with 23 CFR 650 Subpart A, Location and Hydraulic Design of Encroachments on Flood Plains, the DEIS must identify project alternatives which encroach on base floodplains or would support base floodplain development and include a discussion of the following:

- (1) flooding risks;
- (2) impacts on natural and beneficial floodplain values;
- (3) support of probable incompatible floodplain development;
- (4) measures to minimize floodplain impacts; and
- (5) measures to restore and preserve the natural and beneficial floodplain values.

Items (1) through (5) above are discussed as appropriate to topic in Sections 4.3.1.3 (potential direct impacts), 4.3.1.4 (potential secondary and cumulative impacts) and 4.3.1.5 (potential mitigations).

In 1987, when the road design for the project required fill in the river, a hydraulic analysis was performed for two roadway sections requiring significant river fill (WVDOT 1991). Using FEMA flood profile maps, a computer model was generated. Flood elevations were calculated by the computer program to within 0.003 meters (0.01 feet) of published FEMA elevations. The computer model was also modified to reflect changes to the channel cross-sections resulting from project alternative alignments. The result of the 1987 study showed a 100-year flood elevation rise of 0.037 meters (0.12 feet) after construction. The 1991 DEIS concluded that since the 0.037-meter (0.12-foot) rise was well below the regulatory 0.305-meter (1.0-foot) increase allowable, the project would have little or no effect on New River flood elevations (WVDOT 1991).

Since 1991, the roadway design alternatives have been revised to limit fill in the New River to those places where bridges would be required to cross the river and to maintain the roadway centerline of each alternative above 100-year flood elevations as much as possible. Given these improvements to the road design, it is expected that the project will have less impact than the original 0.037-meter (0.12-foot) rise estimated in the 1991 DEIS.

Alternatives 2, 3 and 4 will encroach on the active channel of the New River and the 100-year flood area in the project study area. Encroachments in the form of earth fill, retaining walls, bridge pier footings and/or other project structures are expected to alter flood characteristics of the New River to a small degree. The existing alignment of Route 26, in some locations, falls within the 100-year flood area. The No-Build Alternative will have no new impacts to the 100-year flood area.

Estimates of direct impacts to the 100-year flood area are presented in Table 4.3.D. The No-Build Alternative is not included in Table 4.3.D as this project alternative will not impact the 100-year flood area. Table 4.3.D indicates that Alternatives 2, 3 and 4 will directly impact the 100-year flood area in the project study area. Impacts to the 100-year flood area occur predominantly on the west side of the New River where project alternatives travel in close proximity to the New River. Alternative 2, which essentially runs the length of the west side, impacts approximately three hectares (seven acres) of the 100-year flood area. Alternatives 3 and 4, which have portions of their alignment along the west side of the river, impact one hectare (two acres) and two hectares (five acres) of the 100-year flood area, respectively. Option 2D/3A impacts two hectares (four acres) more of the 100-year flood area compared to Alternatives 2 and 3.

TABLE 4.3.D DIRECT IMPACTS TO THE 100- YEAR FLOOD AREA FOR BUILD ALTERNATIVES IN THE PROJECT STUDY AREA							
	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
100-Year Flood Area Impacted	3 ha ¹ (7ac)	3 ha ¹ (7ac)	3 ha ¹ (7ac)	1 ha ¹ (2ac)	2 ha (5ac)	2 ha (5 ac)	2 ha (5ac)
Percent of Roadway Below 100-year Flood Elevation	2.8% ²	2.8% ²	2.8% ²	1.0% ²	1.8%	1.8%	1.8%
¹ Option 2D/3A impacts 2 ha (4 ac) more of the 100-year flood area compared to Alternatives 2 and 3. ² Small portions of Option 2D/3A may fall below the 100-year flood elevation based on preliminary roadway design; this represents an increase of 1.8 percent of the roadway below the 100-year flood elevation for Alternatives 2 and 3.							

Small portions of the roadway surface of Alternative 2 (2.8 percent), Alternative 3 (1.0 percent) and Alternative 4 (1.8 percent) may fall below the 100-year flood elevation based on preliminary roadway design. Small portions of Option 2D/3A may fall below the 100-year flood elevation based on preliminary roadway design; this represents an increase of 1.8 percent of the roadway below the 100-year flood elevation for Alternatives 2 and 3. Flooding risks associated with Alternatives 2, 3 and 4 and Option 2D/3 A should be minimal as it is expected that final design of the preferred alternative will include alignment adjustments to locate the roadway above the 100-year flood elevation along its entire length.

Riparian sites in the southern section of the NRGNR from Hinton to Meadow Creek consist primarily of small floodplain forests, however, much of the floodplain forest has been cleared or altered for farmland, industry, town sites and homesites (Buhlmann and Vaughan 1987). Construction of the Bluestone Dam has altered the flood regime of the New River below its outfall and reduced beneficial floodplain values in the project study area. Therefore, roadway construction associated with Alternatives 2, 3 and 4 and Option 2D/3A in the 100-year flood area is not expected to have a significant adverse impact on beneficial floodplain values. Roadway construction in the 100-year flood area will have both temporary and permanent impacts on natural resources such as existing vegetation and terrestrial habitat. Some natural resource areas will be permanently replaced with new roadway while other areas will be temporarily disturbed by earthwork activities associated with roadway construction.

Given preliminary road design, the only fill projected to fall below the OHW elevation will occur as a result of bridge construction (bridge pier footings and temporary causeways) and construction of a proposed boat ramp. Bridge pier footings associated with Alternatives 2, 3, and 4 will require fill below the OHW elevation, and will directly impact the New River in the vicinity of Richmond Island, just south of Richmond Farm and south of Brooks Island. Direct

impacts related to bridge pier construction are discussed in Section 4.4 Wetlands and quantified in Table 4.4.B in Section 4.4.1.5.

The FEIS will include a discussion of the requirements of 23 CFR 650 Subpart A in the context of the preferred alternative, and will identify encroachments in the 100-year flood area. Measures to minimize 100-year flood area impacts, and to restore and preserve natural and beneficial flood area values will be further discussed in the FEIS.

4.3.1.4 Potential Secondary and Cumulative Impacts

Because New River levels are controlled by the Bluestone Dam, potential for flooding is minimized below the dam. However, major flooding on the Greenbrier River could affect land and people along the New River between Hinton and I-64. Increased flood levels, discharges and velocities due to encroachment into the 100-year flood area are concerns within the project study area. Potential secondary and cumulative impacts include loss of life and property, damage to roads, houses and structures, alteration of wetlands, and changes to the water regime that will adversely affect vegetation and wildlife habitat.

Incompatible development in the 100-year flood area spurred by construction of a Build Alternative is expected to be minimal on both the east and west sides of the New River. The potential for development in the 100-year flood area in the project study area is constrained by poor access due to the presence of the CSX Railroad and limited developable land on the east side of the river, and the lack of adequate supporting infrastructure, such as sewage treatment facilities and utility service, on both the east and west sides of the river in the project study area. Except for the City of Hinton, there are no local land management ordinances that would prohibit incompatible development in the 100-year flood area. The NPS, however, has been directed to work with local governments to establish land management ordinances to prevent incompatible land uses on private land or to minimize the impacts of such uses on the NRGNR resources and values.

The New River Parkway (NRP) Land Management System (LMS) which will accompany all Build Alternatives will include provisions that discourage incompatible development in the portion of the 100-year flood area which falls within the parkway corridor extending 152 meters (500 feet) either side of the roadway. Through the LMS compatibility assessment review process, developers will be encouraged to minimize new construction in the 100-year flood area. The LMS will require that new construction be at least 30.5 meters (100 feet) from any river or stream and structures to be built in the 100-year flood area be constructed to reduce the potential for flood damage consistent with FEMA regulations. Implementation and enforcement of the 100-year flood area provisions of the LMS will be the responsibility of the relevant local governmental entities to include Raleigh County, Summers County and/or the City of Hinton.

The FEIS will include a discussion of the requirements of 23 CFR 650 Subpart A in the context of the preferred alternative, and will identify the potential for the preferred alternative to support incompatible development in the 100-year flood area.

4.3.1.5 Potential Mitigations

Impacts to the 100-year flood area will be minimized through avoidance, alignment adjustment and the construction of retaining walls to reduce encroachment. Retaining walls, rather than earth fill, will be used to construct the road and other parkway facilities where necessary to avoid further encroachment in the 100-year flood area. Parkway facilities within the 100-year flood area will be limited to bridges, roads, overlooks and other essential recreation features, and will be designed to minimize interference with hydrologic processes of the 100-year flood area and the New River. Impacts to the New River due to bridge pier footing construction could be reduced or eliminated by minimizing the number of bridge piers used or by eliminating the use of bridge piers, where practicable. Potential mitigation strategies related to impacts from bridge pier footing construction are further discussed in Section 4.4 Wetlands.

Vegetation and terrestrial habitat disturbed during roadway construction in the 100-year flood area will be immediately revegetated with appropriate indigenous plant species selected in consultation with the WVDNR. Effective implementation and enforcement of the NRP LMS will help control incompatible development in those portions of the 100-year flood area which fall within the 305-meter (1,000-foot) parkway corridor of the preferred Build Alternative.

The FEIS will include a discussion of the requirements of 23 CFR 650 Subpart A in the context of the preferred alternative, and will identify mitigation strategies to offset floodplain (i.e., 100-year flood area) impacts.

For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

43.2 Water Use

The West Virginia-American Water Company provides water to areas in and near the project study area. The company provides an average of 1,105,308 liters per day (LPD) [292,000 gallons per day (GPD)] from the New and Greenbrier Rivers with a maximum daily capacity of 3,785,300 LPD (1.0 million GPD) and a storage capacity of 2,081,915 liters (550,000 gallons) overhead (J. Routt, Water Quality Superintendent, West Virginia-American Water Company, personal communication, August 1993).

Some residences within the project study area are served by West Virginia-American Water Company but utilize other forms of domestic water supply such as wells, springs and cisterns

while others rely solely on wells, springs, cisterns and/or surface waters for domestic use. Residential areas outside the West Virginia-American Water Company service area utilize domestic water supplies primarily from private wells supplemented by springs, surface waters and/or cisterns (S. Trail, Sanitarian, Summers County, personal communication, March 1994). While the chemical quality of groundwater in the project study area is generally acceptable for most domestic purposes, surface waters with higher concentrations of fecal coliform require some form of treatment in order to use.

Rock in the project study area belong to the Mauch Chunk Group in the Mississippian System. More specifically, they make up the Hinton Formation. In the Mauch Chunk Group, the water-bearing potential for industrial, commercial and residential development is low to moderate, except in localized and highly fractured areas. Fractures or lineaments occur in response to the unloading effect (stress relief) caused by erosion of valleys, and usually are most developed in brittle sandstone, siltstone, coal and limestone. Fractures are local and are confined to lower hillslopes and bottomland areas, and affect the occurrence and amount of groundwater. Water recharged through fractures on hillslope areas percolates into bedding plane fractures under the valley floor and moves toward the mouth of the valley. Fracturing is expected to be common in the project study area (WVDNR and USGS 1984).

The WVDEP Office of Water Resources (OWR) is the agency with surface water and primary groundwater regulatory authority in the project study area.

4.3.2.1 Methodology

Information regarding sources of domestic water supplies and their locations or areas served was obtained from West Virginia-American Water Company, Region 1 Planning and Development Council, Raleigh County Health Department, Summers County Health Department and the West Virginia Health Department.

Groundwater criteria considered important for study include the depth of the water table, quality of groundwater, potential yield, and locations of springs and wells. Information pertaining to these criteria was obtained from publications produced by the United States Department of Agriculture (USDA), USGS and WVDNR.

Springs of West Virginia (McColloch 1986) was used in conjunction with limited field studies to locate springs within the project study area. Only documented springs, regardless of flow volume, are listed by McColloch. A spring is considered documented if its precise location: (1) was entered in the USGS Ground-Water Database, or reported on a USGS Spring Schedule; or (2) was published on a USGS 7.5-minute topographic quadrangle map; or (3) could be determined from the description reported in a water-related publication; or (4) was verified in the field by the USGS and other reliable investigators (McColloch 1986).

The Summers County Sanitarian estimates that less than five percent of the homes in the project study area have a spring-fed water supply (S. Trail, Sanitarian, Summers County, personal communication, March 1995). The exact number and specific locations of wells in the project study area have not been determined since well log information for Raleigh and Summers counties is difficult to retrieve (wells are not listed by location) and because many of the wells in the project study area were in existence before the well log filing system was enacted by localities. A cursory study of well locations relative to project construction limits was performed based on engineering drawings. In most cases, wells are situated behind homes or residences.

Based on the logic of one water supply source per house (outside public water service areas) and a probability of plus or minus five percent, there are approximately 385 wells within 305 meters (1,000 feet) of project alternatives, with about 195 wells on the east side of the New River and 185 on the west side of the river.

4.3.2.2 Affected Environments

Within the project study area, West Virginia-American Water Company serves the City of Hinton, the Brooklin community and an area along Madam Creek. West Virginia-American Water Company also serves Avis and Bellepoint located outside the project study area. It is possible that within 5 to 10 years water could be extended to the Bass Lake and Brooks areas on the east side of the New River.

In areas where public water is not available through the West Virginia-American Water Company, groundwater is utilized as a source of domestic, agricultural, municipal and industrial water supply. To be acceptable for domestic use, the chemical composition of groundwater must not be deleterious to human health nor offensive in taste, odor or color (WVDNR and USGS 1984). Concentrations of calcium carbonate, chloride, iron and manganese which can make water unacceptable for domestic use occur in the New River basin and in the project study area, but vary by location depending on specific site conditions (WVDNR and USGS 1984). The chemical quality of groundwater within the project study area is generally acceptable for most domestic uses, however, throughout much of the project study area, groundwater has an offensive taste, odor and/or color. Naturally occurring contaminants are also common in groundwater and include iron, sulfur, sodium and some manganese (S. Trail, Sanitarian, Summers County, personal communication, July 1995).

The estimated potential yield of groundwater in the project study area ranges from approximately four to 379 liters per minute (LPM) [1 to 100 gallons per minute (GPM)]. The use of groundwater in the project study area, however, is estimated at approximately four to 114 LPM (one to 30 GPM) or an average of 68 LPM (18 GPM) (WVDNR and USGS 1984).

The depth of the water table varies in the project study area with elevation and topography. Generally, higher elevations on hilltops have greater depths to the water table, while low-lying areas near the river have smaller depths to the water table. In Hinton, the depth to the water table is approximately five to six meters (15 to 20 feet) (WVDNR 1976). Raleigh County and Summers County soil surveys indicate depths to the seasonal high water tables ranging from 0.31 meters (one foot) in low-lying areas and depressions to over 1.83 meters (six feet) in most other areas (USDA 1975 and 1984).

No formally documented springs exist within the project study area (McColloch 1986). However, a spring located near Route 26 on the Richmond Farm was identified in the field by DOH representatives. Several homeowners have indicated that their tap water is spring fed. Many springs are believed to exist as a source of water for homes located along the west side of the New River, although the precise number is unknown (B. Wolman, Sanitarian, Raleigh County, personal communication, March 1995). Steve Trail (p.c., March 1995) indicated that approximately 10 percent of the homes beyond Hinton's water supply area on the east side of the New River are supplied with water from springs. Because springs typically seep from outcrops along the toe of mountains, areas near WV 20, Route 26 and Raleigh County Route 27/2 (Route 27/2) could be affected by project construction.

From initial reviews of rock types in the project study area, it is estimated that fractures or lineaments are common on both sides of the New River. The area most likely to be affected is Chestnut Mountain where blasting could be required to construct the new roadway.

4.3.2.3 Potential Direct Impacts

No impacts to domestic, agricultural, municipal or industrial water supplies are anticipated in the project study area for those areas served by the West Virginia-America Water Company. However, residences in the project study area that rely on groundwater-fed domestic water supplies, such as streams, wells and springs, could be adversely impacted by project construction. Potential impacts to groundwater-fed water supplies include alterations to water quantity and quality. Such impacts include reduction of water supplies due to interruption of flow and lowering of the water table. Road cuts and blasting associated with highway construction may fracture water-bearing strata and lower the water table. Alternatives that require more cutting and blasting into the mountain side have a greater potential to adversely impact groundwater, including wells and springs.

4.3.2.4 Potential Secondary and Cumulative Impacts

Streams, wells, springs and the New River receive at least part of their water supply from groundwater sources. Impacts to the supply and quality of groundwater could, therefore, affect the supply and quality of water in wells, springs, streams and the New River.

Additional housing development will occur with or without the parkway and will bring more impervious cover, reduce infiltration, add more wells tapping groundwater supplies and thus may reduce both the quantity and quality of groundwater in the project study area. As future development will be greater with implementation of the project, impacts to groundwater-fed water supplies will likely be higher for the Build Alternatives.

With the addition of a sewage treatment package plant at Sandstone in the next several years and the possibility of a public water supply system over the longer term (10 to 20 years), growth near the I-64 interchange is a possibility. With the Build Alternatives, major developments within the parkway corridor will need to be reviewed and approved through the LMS compatibility assessment review process. Insofar as new development within the parkway corridor near Sandstone and the I-64 bridge will be evaluated through the LMS compatibility assessment review process, more environmentally-sensitive development plans are likely to be initiated and implemented in these locations. Agreements and partnerships between the various stakeholders will be necessary if environmentally-sensitive projects are to occur in the project study area. Such partnerships are possible, due to the involvement of federal, state and local agencies and the public in the parkway planning process.

If, in the future, Route 26 is improved to similar standards as west side parkway alternatives, cumulative impacts to groundwater-fed water supplies are expected. Alternatives 3, 4 and the No-Build Alternative each have potential cumulative impacts related to Route 26 road improvements.

4.3.2.5 Potential Mitigations

During final design, all feasible ways to avoid or minimize disturbance to water-bearing strata, fractures in bedrock where groundwater is recharged, and wells and springs will be evaluated, and the most practicable mitigation strategy selected. If other construction techniques can be used, prohibition of blasting to construct the roadbed will be considered in areas where blasting would likely block lineaments or adversely impact groundwater supply. Recommendations provided by geologists, hydrologists and water quality specialists will guide project construction activities in order to avoid or minimize impacts to domestic water supply.

During construction, heavy equipment will be stored and refueled away from wells, springs or other groundwater supply areas. Construction staging areas will be determined during final design. During and after project construction, reduction and/or avoidance of herbicide use will be considered within the parkway corridor.

Where springs are located in close proximity to the parkway, culverts will be installed to allow them to flow unimpeded. Homeowners of formally documented wells and springs who have

water supplies that are adversely impacted by project construction will receive a new water supply system or will otherwise be reimbursed by the DOH.

For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.3.3 Water Quantity

The Middle New River basin occupies 2,848 square kilometers (1,100 square miles) in five southeastern West Virginia counties and is part of the larger New River watershed. The New River originates in North Carolina, flows through Virginia and into West Virginia where it is bordered by the Coal, Kanawha, and Gauley River basins to the north; by the Bluestone and Guyandotte River basins to the west; and by the Greenbrier River basin to the east (WVDNR 1976 and 1983). The Greenbrier River and Bluestone River basins are not included as part of the Middle New River basin, however, they are two of the largest tributaries to the New River.

The contributing drainage area of the New River at the Hinton streamflow-gaging station is 16,195 square kilometers (6,256 square miles) of which 11,911 square kilometers (4,601 square miles) are regulated by the Bluestone Dam.

The Greenbrier River is the largest tributary of the New River, joining in downstream from Bluestone Dam, and offers an uncontrolled supply of water to the New River. The unregulated Greenbrier River meets the New River 1.6 kilometers (1 mile) downstream from the Bluestone Dam and 2.4 kilometers (1.5 miles) upstream from the Hinton streamflow-gaging station, and drains an area of 4,248 square kilometers (1,641 square miles) or 26 percent of the New River drainage area as measured at the Hinton streamflow-gaging station. A smaller drainage area of 36 square kilometers (14 square miles) is contained between the Hinton streamflow-gaging station and measured locations at Bluestone Dam and the Greenbrier River (Wiley and Cunningham 1994).

The Bluestone River meets the New River just upstream from the Bluestone Dam and its 1,193 square kilometer (461 square mile) drainage area is regulated by the dam. The Bluestone Dam, completed in 1952 and located on the New River upstream from Hinton, is operated for the purpose of regulating flood flows. As a result of the dam, the portion of the New River that includes the project study area has one of the smallest ranges of stream flow (rise and fall) on the New River (WVDNR 1976).

Between Hinton and Meadow Creek, the New River is approximately 259 meters (850 feet) wide with an average depth of 1.5 meters (5 feet) at a discharge of 57 cubic meters (2,000 cubic feet) per second and an average slope of 0.5 meters (1.5 feet) per 305 meters (1,000 feet) (Wiley and

Cunningham 1994). Numerous perennial and intermittent streams of various lengths drain land on the east and west sides of the New River in the project study area.

4.3.3.1 Methodology

Watersheds

The watersheds in and around the project study area are described in two documents: *The Comprehensive Survey of the New River Basin, Vol. 1* (WVDNR 1976); and *New River Basin Plan* (WVDNR 1983). These sources, as well as a USGS 1:100,000 scale map, were used to delineate watersheds that drain into the New River within the project study area. The area drained by each watershed was estimated from the USGS map using a planimeter.

Perennial and Intermittent Streams

Perennial streams are streams that flow for at least six months or more a year, and normally support aquatic life whose life history requires residence in flowing waters for a continuous period of at least six months (West Virginia Environmental Quality Board 1993). Intermittent streams are streams that have no flow during prolonged periods of little or no precipitation, generally less than six months per year, and that do not support aquatic life whose life history requires residence in flowing waters for a continuous period of at least six months (WVEQB 1993). In the New River gorge, a continuous period of flow generally lasts from December through May with peak flows occurring in March. Dry periods with little or no flow occur from June through October or November with the lowest flow in September (WVDNR 1976).

Perennial streams were preliminarily identified from 1:100,000 USGS topographic maps. A survey of all USGS-identified intermittent streams in the project study area was undertaken to determine whether or not these streams were in fact "intermittent" based upon definitions in Title 46 of the 1993 Legislative Rules, *Series 1, Requirements Governing Water Quality Standards* promulgated by the WVDEP Environmental Quality Board. Intermittency of streams was determined through identification of benthic macroinvertebrates and their life cycles. Dr. Reese Voshell, a leading aquatic entomologist in this region, assisted in defining the approach to complete the intermittent stream survey (R. Voshell, Virginia Tech, personal communication, February 1995).

Prior to beginning the benthic macroinvertebrate study, the methodology was discussed and tentatively approved by representatives of the NPS (K. Stephens, NPS, p.c., February-March 1995), WVDEP (J. Smithson, WVDEP, p.c., February 1995 and B. Taylor, WVDEP, p.c., February-March 1995) and WVDNR (J. Clayton, WVDNR, p.c., March 1995 and D. Wood, WVDNR, p.c., March 1995). The benthic macroinvertebrate study qualitatively sampled 100-meter (328-foot) stream reaches near proposed road crossings. All USGS-designated intermittent

streams and several streams not shown on USGS maps were examined in the study. Two perennial streams were also examined as part of the benthic macroinvertebrate study (Marshall 1995).

Macroinvertebrates were sorted from debris, identified and preserved with 70 percent ethanol in the field. Each site was sampled for approximately one hour unless no new taxa were found within approximately 30 minutes of the start of each stream inventory. A brief description of each site was also recorded. In the lab, specimen field identifications were verified and improved to the genus or species level. Benthic macroinvertebrate taxa requiring flowing water for periods of at least six months were identified consistent with WVDEP requirements. Streams were defined as *perennial* if at least two such taxa were identified (Marshall 1995).

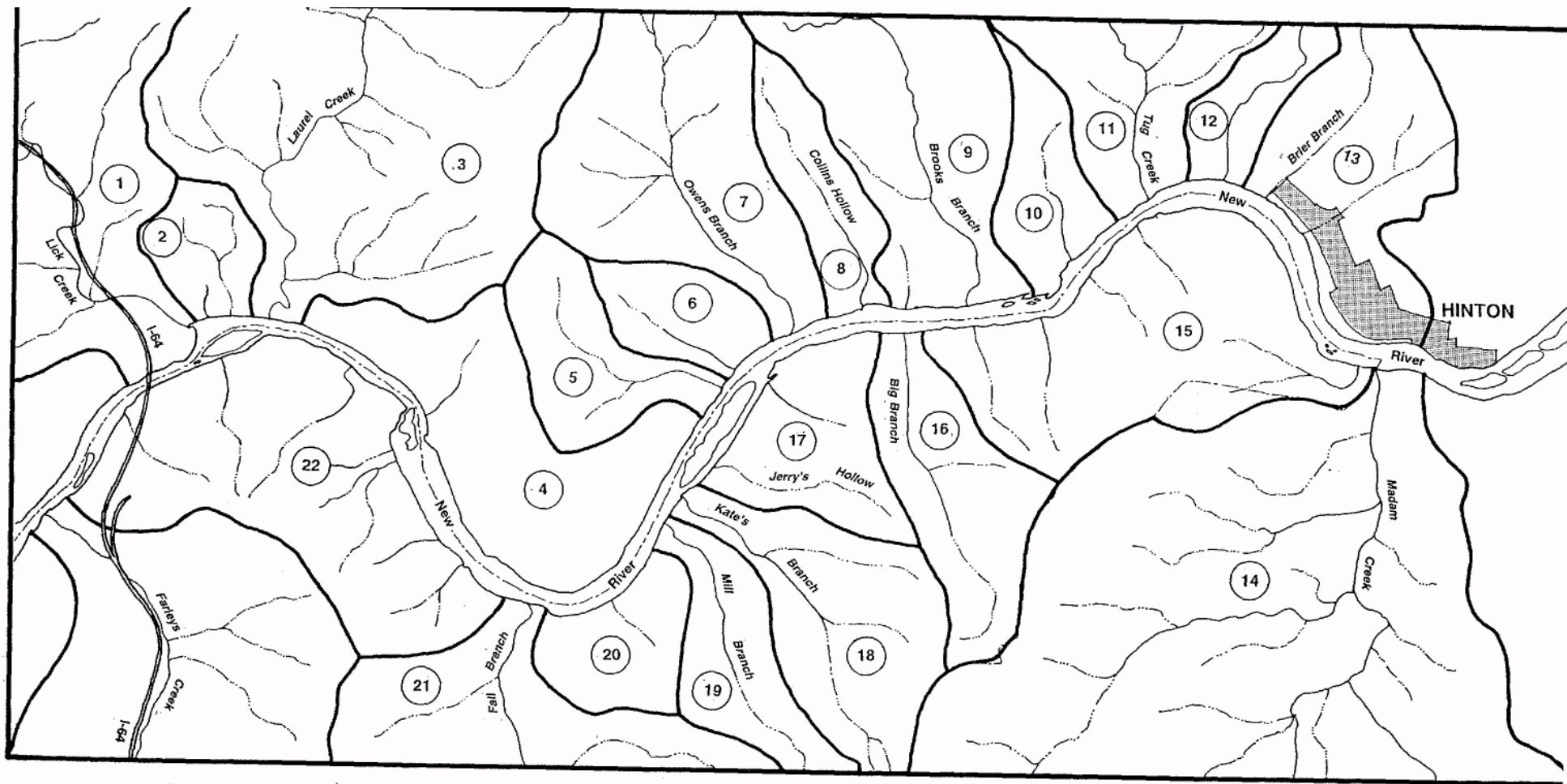
4.3.3.2 Affected Environments

Watersheds

Within the project study area, approximately 275.6 square kilometers (106.4 square miles) of land drain into the New River from 22 smaller watersheds. The project study area watershed is drained by 26 perennial streams and 10 overland or intermittent streams. The smaller watersheds associated with these streams range in size from approximately one square kilometer (0.4 square miles) to 103.6 square kilometers (40 square miles) (see Figure 4.3.a and Table 4.3.E).

The largest watersheds draining into the project study area are the Lick Creek watershed and the Laurel Creek watershed, draining approximately 103.6 and 47.4 square kilometers (40 and 18.3 square miles), respectively. Both Lick and Laurel creeks drain into the New River from the east side near the Sandstone community. The Madam Creek watershed is the third largest watershed, draining approximately 32.9 square kilometers (12.7 square miles) and flowing into the New River from the west side at Brooklin.

TABLE 4.3.E WATERSHEDS AND THEIR DRAINAGE AREAS FOR THE PROJECT STUDY AREA			
Map ID No.	Watershed	Drained by Perennial Stream	Approximate Area Drained
1	Lick Creek	yes	103.6 km ² (40.0 mi ²)
2	Sandstone	no	1.0 km ² (0.4 mi ²)
3	Laurel Creek	yes	47.4 km ² (18.3 mi ²)
4	Chestnut Mountain	no	4.1 km ² (1.6 mi ²)
5	Unnamed	yes	1.8 km ² (0.7 mi ²)
6	Unnamed	no	1.3 km ² (0.5 mi ²)
7	Owens Branch	yes	6.0 km ² (2.3 mi ²)
8	Collins Hollow	no	1.8 km ² (0.7 mi ²)
9	Brooks Branch	yes	12.7 km ² (4.9 mi ²)*
10	Unnamed	no	1.3 km ² (0.5 mi ²)
11	Tug Creek	yes	8.3 km ² (3.2 mi ²)*
12	Unnamed	yes	2.6 km ² (1.0 mi ²)
13	Hinton	no	3.9 km ² (1.5 mi ²)
14	Madam Creek	yes	32.9 km ² (12.7 mi ²)*
15	Richmond Bottom	no	6.5 km ² (2.5 mi ²)
16	Big Branch	yes	3.1 km ² (1.2 mi ²)
17	Jerrys Hollow	no	2.6 km ² (1.0 mi ²)
18	Kates Branch	yes	3.9 km ² (1.5 mi ²)
19	Mill Branch	yes	2.6 km ² (1.0 mi ²)
20	Unnamed	no	1.8 km ² (0.7 mi ²)
21	Fall Branch	yes	20.7 km ² (8.0 mi ²)*
22	Sandstone Falls	no	5.7 km ² (2.2 mi ²)
TOTAL			275.6 km ² (106.4 mi ²)
* Denotes watershed areas which were taken from <i>Comprehensive Survey of New River Basin</i> (WVDNR 1976). Areas without (*) were calculated from USGS 1:100,000 maps and 1:12,000 base maps using a planimeter.			



NORTH

0 .5 1 2 3 KILOMETERS

0 .5 1 2 MILES

— WATERSHED BOUNDARY



WATERSHED MAP I.D. NUMBER

— PERENNIAL STREAM

- - - INTERMITTENT STREAM

WATERSHEDS

New River Parkway
West Virginia

Northern
Section

Fig. 4.3

Perennial and Intermittent Streams

A total of 36 streams drain the land in the project study area into the New River. Based upon USGS data and the findings of the benthic macroinvertebrate study, 26 of these streams are perennial and 10 are intermittent. Twelve perennial streams drain the land on the east side of the New River in the project study area. Fourteen perennial streams drain the land on the west side of the New River in the project study area. Ten intermittent streams were identified in the project study area, four on the east side of New River and six on the west side.

Table 4.3.F lists the names or locations of perennial and intermittent streams in the project study area. Perennial and intermittent streams that were examined as part of the benthic macroinvertebrate study are noted with a single asterisk (*); streams that were examined and found to be perennial based on the two taxa criteria are noted with a double asterisk (**).

The location of perennial and intermittent streams in the project study area are shown in Figures 4.4.a, 4.4.b and 4.4.c in Section 4.4 Wetlands.

TABLE 4.3.F PERENNIAL AND INTERMITTENT STREAMS IN THE PROJECT STUDY AREA (See Figures 4.4.a, 4.4.b and 4.4.c)			
Map I.D.	Stream Name or Location	Map I.D.	Stream Name or Location
Perennial Streams Draining Land on the East Side of the New River		Perennial Streams Draining Land on the West Side pf the New River	
E-P1	Lick Creek	W-P1	Madam Creek
E-P2	Unnamed stream south of Lick Creek"	W-P2	Unnamed stream just north of Madam Creek**
E-P3	Laurel Creek	W-P3	Unnamed stream between Brooks Falls & Tug Rapids
E-P4	Unnamed stream in vicinity of Sandstone Falls"	W-P4	Unnamed stream across New River from Barksdale**
E-P5	Unnamed stream near southern tip of Brooks Island	W-P5	Big Branch" (reference or control stream)
E-P6	Unnamed stream just south of Brooks Island"	W-P6	Unnamed stream near southern tip of Brooks Island**
E-P7	Owens Branch	W-P7	Kates Branch
E-P8	Collins Hollow"	W-P8	Mill Branch
E-P9	Brooks Branch"	W-P9	Fall Branch
E-P10	Unnamed stream north of Tug Rapids"	W-P10	Unnamed stream north of Long Bottom/Fall Branch**
E-P11	Tug Creek	W-P11	Unnamed stream south of Sandstone Fall s**
E-P12	Unnamed stream within Hinton city limits	W-P12	Unnamed stream just south of Sandstone Falls**
		W-P13	Unnamed stream north of Sandstone Falls**
		W-P14	Unnamed stream near Richmond Island**
Intermittent Streams Draining Land on the East Side of the New River		Intermittent Streams Draining Land on the West Side of the New River	
E-I1	Unnamed stream near Sandstone'	W-11	Unnamed stream at Tug Rapids*
E-I2	Unnamed stream near Bass Lake"	W-12	Unnamed stream north of Tug Rapids*
E-I3	Brier Branch'	W-13	Jerrys Hollow*
E-I4	Unnamed stream in Hinton	W-14	Unnamed stream near Long Bottom*
		W-15	Unnamed stream near Sandstone Falls*
		W-16	Unnamed stream north of I-64 bridge (not crossed)
Perennial and intermittent streams which were examined as part of the benthic macroinvertebrate study are noted with a single asterisk (*); streams which were examined and found to be perennial based on study methodology are noted with a double asterisk (**).			

4.3.3.3 Potential Direct Impacts

Watersheds

Construction, operation and maintenance activities associated with any of the Build Alternatives have the potential to alter drainage patterns, water absorption rates, overland flow rates, and flow rates of creeks and streams. Alteration of any of these conditions may adversely affect watershed components including the New River, perennial and intermittent streams, groundwater, water quality and land use.

Potential direct impacts to the watersheds that drain into the New River in the project study area primarily involve changes to the quantity of stormwater runoff associated with impervious surface area due to construction of the roadway and associated recreation sites. Table 4.3.G indicates impervious surface impacts for Build Alternatives in the project study area. The No-Build Alternative is not included in Table 4.3.G as it will have no additional impervious surface area impacts in the project study area.

Since all Build Alternatives will follow existing road corridors (either WV 20 or Route 26) for major portions of their alignment, impervious surface area impacts are presented in Table 4.3.G in terms of actual impervious surface area *additions* beyond impervious surface areas associated with existing WV 20 and Route 26. Total impervious surface area additions include additional paved surfaces associated with construction of the parkway road and associated parkway recreation sites. Impervious surface area additions associated with construction of the parkway road include: (1) widening of the paved portions of WV 20 and Route 26 shared by project alternatives to meet roadway design criteria (refer to Figure 2.1.a for typical roadway sections and Table 5.4.B for a summary of existing conditions along WV 20 and Route 26); (2) additions from the use of curbed road sections and/or paved shoulders along project alternatives (refer to Figure 2.1.a for typical roadway sections); (3) new alignments over Chestnut Mountain, along the CSX Railroad in Hinton, and behind Cochran Cemetery and Richmond Bottom; and (4) new alignments from the end of the paved portion of Route 26 at the Route 27/2 intersection on the west side of the river to the WV 20 tie-in (for Alternatives 2A and 4A) and to the end of the project at the Route 7 intersection (for Alternatives 2B, 2C, 4B and 4C).

Table 4.3.G indicates that none of the Build Alternatives will contribute more than 0.42 percent *additional* impervious surface area in comparison to the total amount of land or to the total amount of terrestrial habitat in the project study area. Option 2D/3A will require 0.6 hectares (1.6 acres) less impervious surface area additions beyond existing roads compared to Alternatives 2 and 3. Option 4D will require 1.5 hectares (3.7 acres) less impervious surface area additions beyond existing roads compared to Alternative 4. Increases in stormwater runoff associated with roadway impervious surface area additions are expected to have minimal impact on drainage

patterns, water absorption rates, overland flow rates, or flow rates of the New River and streams in the project study area.

TABLE 4.3.G IMPERVIOUS SURFACE AREA (ISA) ADDITIONS FOR BUILD ALTERNATIVES IN THE PROJECT STUDY AREA (PSA)

	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
WV 20 travel lane widening additions¹	0.1 ha (0.3 ac)	-	-	0.5 ha (1.4ac)	0.9 ha (2.3 ac)	0.9 ha (2.3 ac)	0.9 ha (2.3 ac)
Rt. 26 travel lane widening additions²	3.0 ha (7.4 ac)	3.0 ha (7.4 ac)	3.0 ha (7.4 ac)	1.7 ha (4.1 ac)	1.8 ha (4.4 ac)	1.8 ha (4.4 ac)	1.8 ha (4.4 ac)
Additions from use of curbed roadway sections and/or paved shoulders	1.2 ha (3.0 ac)	1.1 ha (2.7 ac)	1.2 ha (2.9 ac)	5.6 ha (13.8 ac)	2.0 ha (4.9 ac)	2.2 ha (5.4 ac)	2.3 ha (5.6 ac)
New alignment over Chestnut Mountain	-	-	-	1.9 ha (4.7 ac)	-	-	-
New alignment @ CSX Railroad	-	-	-	-	1.5 ha (3.7 ac)	1.5 ha (3.7 ac)	1.5 ha (3.7 ac)
New alignment @ Richmond Bottom	1.2 ha (2.9 ac)	1.2 ha (2.9 ac)	1.2 ha (2.9 ac)	1.2 ha (2.9 ac)	-	-	-
New alignment @ Cochran Cemetery	0.3 ha (0.7 ac)	0.3 ha (0.7 ac)	0.3 ha (0.7 ac)	0.2 ha (0.5 ac)	0.1 ha (0.2 ac)	0.1 ha (0.2 ac)	0.1 ha (0.2 ac)
New alignment from Rt. 26/Rt. 27/2 intersection to WV 20 tie-in	0.7 ha (1.5ac)	-	-	-	0.7 ha (1.5ac)	-	-
New alignment from Rt. 26/Rt. 27/2 intersection to end of project		(4.1 ac)	(4.1 ac)			(4.1 ac)	(4.1 ac)
Total ISA additions from construction of the parkway road	6.5 ha (16.1 ac)	7.3 ha (17.8 ac)	7.4 ha (18.0 ac)	11.1 ha (27.4 ac)	7.0 ha (17.3 ac)	8.2 ha (20.1 ac)	8.3 ha (20.3 ac)
Total ISA additions from construction of parkway recreation sites	0.1 ha (0.3 ac)	0.1 ha (0.3 ac)	0.1 ha (0.3 ac)	0.1 ha (0.3 ac)	0.1 ha (0.3 ac)	0.1 ha (0.3 ac)	0.1 ha (0.3 ac)
TOTAL IMPERVIOUS SURFACE AREA (ISA) ADDITIONS	6.6 ha (16.4 ac)	7.4 ha (18.1 ac)	7.5 ha (18.3 ac)	11.2 ha (27.7 ac)	7.1 ha (17.6 ac)	8.3 ha (20.4 ac)	8.4 ha (20.6 ac)
ISA additions compared to all land in the PSA	0.22%	0.24%	0.24%	0.36%	0.23%	0.27%	0.27%
total terrestrial habitat in the PSA	0.25%	0.28%	0.28%	0.42%	0.27%	0.31%	0.31%

¹ Calculations for required widening for WV 20 are based upon an average existing paved roadway width of 6.2 meters (20.4 feet) (see Table 5.4.B) and a proposed roadway width of 7.3 meters (24 feet) exclusive of curve widening and superelevation.

² Calculations for required widening for Route 26 are based upon an average existing paved roadway width of 4.6 meters (15 feet) (see Table 5.4.B) and a proposed roadway width of 6.7 meters (22 feet) exclusive of curve widening and superelevation.

Perennial and Intermittent Streams

Table 4.3.H indicates the number of perennial and intermittent streams crossed by each Build Alternative in the project study area. The No-Build Alternative is not included in Table 4.3.H since it will have no impact on existing streams in the project study area.

Table 4.3.H indicates that Alternatives 2A and 4A will cross the greatest number of perennial streams (16 and 17, respectively), while Alternatives 3 and 2B will cross the fewest number of perennial streams (12 and 13, respectively). Alternatives 2A, 4A, 4B and 4C will cross the greatest number of intermittent streams (6, 7, 6 and 6, respectively). Alternative 3 will cross the fewest number of intermittent streams (3).

TABLE 4.3.H PERENNIAL AND INTERMITTENT STREAMS CROSSED BY BUILD ALTERNATIVES IN THE PROJECT STUDY AREA							
Stream Type	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
Perennial Streams (26 perennial streams total)	16	13	14	12	17	14	15
Intermittent Streams (10 intermittent streams total)	6	5	5	3	7	6	6
Total Number of Streams Crossed	22	18	19	15	24	20	21

Table 4.3.1 summarizes drainage structures required for perennial and intermittent stream crossings for the Build Alternatives in the project study area. The No-Build Alternative is not included in Table 4.3.1 as this project alternative will require no new drainage structures. More detailed information on drainage structures required for perennial and intermittent stream crossings can be found in Appendix H: Water Resources - Stream Crossing Details and Bridge Construction Options.

Alternative 3 will require two new bridges to cross perennial streams in the project study area while Alternatives 2 and 4 will each require one new bridge to cross a perennial stream in the project study area. Alternatives 2 and 4 will each require one renovated bridge to cross a perennial stream in the project study area.

4.3.3.4 Potential Secondary and Cumulative Impacts

Watersheds

Greater amounts of impervious surfaces associated with project roadways and facilities will cause changes to the velocity and amount of surface runoff, although, in relation to the size of watersheds in the project study area, these increases are anticipated to be small (FHWA 1985).

Perennial and Intermittent Streams

Increases in the quantity of stormwater runoff arising from increases in impervious surface areas associated with the parkway and future development in the project study area could create additional soil erosion and sedimentation impacts on streams in the project study area. Terrestrial and aquatic communities which require certain flow rates for survival could be adversely affected by future development in the project study area. Such impacts could also result in potential adverse impacts to river-based recreational activities, such as hunting and fishing, and could reduce water supplies in some areas. The LMS will encourage development practices that minimize such impacts.

If perennial streams are bridged and if bottomless or oversized culverts are used for intermittent stream crossings for project alternatives, potential long-term, adverse impacts to stream channel and flow characteristics would not be anticipated. In some cases, the removal of an existing culvert and the addition of a new bridge or larger culvert could be a first step in rehabilitating the stream, and improving its flow and channel characteristics.

4.3.3.5 Potential Mitigations

Watersheds

To mitigate impacts to drainage patterns, disturbed areas will be graded and revegetated so as to reduce the flow velocity and quantity of stormwater runoff from construction activities and impervious surface areas. To mitigate impacts to the water absorption character of the New River watersheds and to overland flow rates of land in the project study area: (1) disturbed sites will be protected from accelerated runoff and erosion by applying best management practices, and soil erosion and sediment controls; and (2) where possible, pervious materials will be used for constructing roads and lining drainage channels to reduce peak discharges and promote water absorption. In particular, the use of infiltration beds beneath the road will be considered for narrow areas between mountain slopes and the New River.

Perennial and Intermittent Streams

Existing bridges and culverts which are structurally sound and sufficiently sized to meet design and engineering standards will be retained intact or retrofitted for project use. To mitigate impacts to the flow rates of streams, open span/abutment-to-abutment type bridges will be considered where perennial streams are to be crossed. Three-sided (bottomless) or oversized round culverts will be used to cross perennial streams not bridged and intermittent streams. Where used, round culverts will be oversized and buried deeper than the existing streambed to allow the formation of a natural stream bottom and to provide for the unhindered passage of smaller terrestrial and aquatic animals. The use of bridges, bottomless culverts and oversized culverts will minimize direct impacts to the beds and banks of streams, and will also reduce longer-term impacts to stream hydrology as they are less of a physical barrier to water flows and to terrestrial and aquatic wildlife movements (WVDOT 1992). All reasonable efforts will be made to reestablish the natural substrate and function of streams where project construction results in disturbance to beds and banks of streams. Final stream crossing treatments for perennial and intermittent streams will be decided upon during final design and reviewed with the appropriate state and federal resource agencies.

Bridges constructed at stream crossings will be designed to locate associated abutments and pier structures so as not to restrict debris passage and alteration of flow patterns in streams. Heavy rip-rap drainageways will be constructed only as needed to reduce runoff velocities on steeper slopes, such as those where project alternatives cross Chestnut Mountain on the east side of the New River.

Impacts related to the quantity of water draining into streams in the project study area from the roadway will be addressed by controlling stormwater runoff in a manner that results in as little change as possible to existing drainage patterns. Infiltration beds and vegetated swales will be used where practicable and appropriate. In final project design, all practicable ways to reduce the effects of stormwater runoff on perennial and intermittent streams will be explored.

For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.3.4 Water Quality

Special waters of the state are defined in Title 46 of the 1993 Legislative Rules, *Series I, Requirements Governing Water Quality Standards* promulgated by the WVDEP Environmental Quality Board. The West Virginia Division of Natural Resources (WVDNR), Water Resources Division, provided information regarding specific rivers and streams within the project study area that have been designated as special waters. The following summary lists special waters

recognized by the State of West Virginia, and the rivers and streams in the project study area designated as such:

- High quality waters whose quality is equal to or better than the minimum levels necessary to achieve the national water quality goal uses. Included are streams or stream segments that receive annual stockings of trout (WVEQB 1993): *all perennial streams and rivers in the project study area except Madam Creek.*
- Streams designated by the West Virginia Legislature under the West Virginia Natural Streams Preservation Act, pursuant to W. Va. Code §20-5B-1 (WVEQB 1993): *none in the project study area.*
- West Virginia high quality streams which are warmwater streams over 8 kilometers (5 miles) in length with desirable fish populations and public utilization thereof, and all streams which are stocked with trout or contain native trout populations (WVDNR 1986): *the New River.*
- National Resource Waters including, but not limited to, all federally-designated rivers under the "Wild and Scenic Rivers Act," Public Law 95-542, as amended, 16 U.S.C. 1271, et seq; all naturally-reproducing trout streams; all streams and other bodies of water in State and National Forests and Recreation areas (WVEQB 1993): *the New River.*
- National Rivers as designated by the "National Parks and Recreation Act of 1978," Public Law 95-625, as amended, 16 U.S.C., et seq (WVEQB 1993): *the New River.*

Section 46-1-4 of the 1993 Legislative Rules indicates the level of protection given to special waters. According to this section, National Resource Waters are to be maintained, protected and improved where necessary. Trout and other high quality waters must be maintained at their existing high quality unless it is determined, after opportunity for public comment and hearings, that allowing for lower water quality is necessary to accommodate important economic or social development within areas in which the waters are located.

4.3.4.1 Methodology

Water quality standards for interstate streams and rivers were adopted by West Virginia as required by the Water Quality Act of 1965 (U.S. Public Law 89-234). These standards were revised to comply with the 1972 Federal Water Pollution Control Act Amendment (U.S. Public Law 92-500), which provides for uniform, nationwide water quality standards, enforceable regulations and a nationwide permit program for municipal, industrial and other discharges. See Table 4.3.J for specific water quality criteria for selected water quality parameters.

Criteria for water quality standards are based on usability. Between the Bluestone Reservoir and the confluence of the New and Gauley rivers, the water in the New River is commonly used for fish and wildlife, recreation, public and private potable water supply, industry and agriculture (WVDNR 1976). The water of the New River is considered suitable for these uses if acceptable levels of the following are met: dissolved oxygen, pH, temperature, threshold odor, toxic

substances, bacteria, fecal coliform content, radioactivity, heavy metals and other compounds. Information about the quality of water of the New River in the project study area was taken from documented studies conducted by the WVDNR (1993) and Sullivan (1993).

**TABLE 4.3.J WEST VIRGINIA ENVIRONMENTAL QUALITY BOARD
SPECIFIC WATER QUALITY CRITERIA FOR SELECTED
WATER QUALITY PARAMETERS**

Parameter	Units	Water Use Categories				
		Warmwater (B1, B3, B4)	Troutwater (B2)	Recreation (C)	Public (A)	AH Other Uses
8.1 Aluminum (Al)	ug/l	748	87	--	--	--
8.11 Dissolved Oxygen	mg/l	not < 5.0	not < 6.0	not < 5.0	not < 5.0	--
8.12 Fecal Coliform	counts	--	--	see note # 1	see note # 1	--
8.15 Iron (Fe)	mg/l	1.5	0.5	--	1.5	--
8.17 Manganese (Mn)	mg/l	1.0	1.0	--	1.0	--
8.23 pH	--	6.0-9.0	6.0 - 9.0	6.0-9.0	6.0 - 9.0	6.0 - 9.0
8.32 Turbidity	NTU	see note #2	see note #2	see note #2	see note #2	see note #2

Notes:

1. Maximum allowable level of fecal coliform content for Primary Contact Recreation (either MPN or MF) shall not exceed 200/100ml as a monthly geometric mean based on not less than 5 samples per month; nor exceed 400/100ml in more than ten percent of all samples taken during the month.

2. No point or nonpoint source to West Virginia's waters shall contribute a net load of suspended matter such that the turbidity exceeds 10 NTLTs over background turbidity when the background is 50 NTU's or less, or have more than a 10 percent increase in turbidity (plus 10 NTU minimum) when the background turbidity is more than 50 NTU's. This limitation shall apply to all earth disturbance activities and shall be determined by measuring stream quality directly above and below the area where drainage from such activity enters the affected stream. Any earth disturbance activity continuously or intermittently carried on by the same or associated persons on the same stream or tributary segment shall be allowed a single net loading increase.

Water Use Categories:

A - Water Supply, Public. Used to describe water which, after conventional treatment, are used for human consumption, and includes: all community domestic water supply systems; all non-community domestic water supply systems; all private domestic water systems; and all other surface water intakes where the water is used for human consumption.

B1 - Warm Water Fisheries Streams. Streams or stream segments which contain a fish population composed overwhelmingly of warm water species. (These are primarily sport fisheries and may be stocked with trout seasonally.)

B2 - Trout Waters. Streams or stream segments which sustain year-round trout populations. Excluded are those streams or stream segments which receive annual stockings of trout but which do not support year-round trout populations.

B3 - Small Non-Fishable Streams. Streams or stream segments which because of their size or flow patterns do not offer sport fishing; they generally contain only minnows, darter, etc.

B4 - Wetlands. Such areas as swamps, marshes, bogs and other land subject to frequent saturation or inundation, and which normally support a prevalence of vegetation typically found where wet soil conditions prevail.

C - Water Contact Recreation. Includes swimming, fishing, water skiing and certain types of pleasure boating such as sailing in very small craft and outboard motor boats.

Source: WVEQB 1993.

As previously discussed in Section 4.3.3.1, a benthic macroinvertebrate study of selected streams in the project study area was undertaken to determine the perennial or intermittent status of such streams (Marshall 1995). Because the purpose of the benthic macroinvertebrate survey was to determine which streams support communities typical of perennial flow, the results offer only limited characterization of water quality. Pollution tolerance values (t) from the Hilsenhoff Biotic Index (HBI) for each taxon were used to calculate the mean HBI tolerance of all taxa collected at each site. This procedure is different from calculating the HBI for a community in that tolerances are not weighted by the relative abundance of each taxon. HBI tolerances range between 0 and 10, with 0 indicating no tolerance, and 10 indicative of high tolerance. As a very gross indicator of water quality, it can be assumed that communities having a mean tolerance value less than five are dominated by intolerant taxa and probably have high water quality. Communities with a mean tolerance of five or greater are dominated by taxa with high pollution tolerance and likely have lower water quality (B. Marshall, personal communication, July 1995).

4.3.4.2 Affected Environments

From 1964 to 1965, the Wheeling Field Station of the EPA conducted a water quality survey of the New River basin. The survey generally found the water quality in the basin to be good, except for high concentrations of fecal coliform caused by domestic sewage (WVDNR 1976). Since 1980, the NPS and the WVDNR have monitored the New River and many of its tributaries for sewage and animal wastes (WVDNR 1988 and 1993). Monitoring sites within the project study area are located at mainstream and tributary stations as follows (Sullivan 1993):

- 01-M: located on the west side of the New River behind the Visitor Center and is approximately one mile downstream of the Bluestone Dam.
- 02-T: located on Madam Creek immediately downstream of the River Road bridge across Madam Creek.
- 03-M: located on the west side of the New River at Sandstone Falls approximately seven miles downstream of Site 02T, down river of the constriction of the main falls, and is just off the end of the newly completed boardwalk.
- 04-M: located on the west side of the New River approximately seven miles downstream of Site 02T, adjacent to Sandstone Falls campground.
- QS-T: located on Lick Creek at the stream gauge site.

M = mainstream sampling station

T = tributary sampling station

The techniques used to monitor fecal coliform at these sites can only be used to suggest areas where problems may exist. Table 4.3.K includes fecal coliform levels for selected sites in the project study area and for the NRGNR Visitor Center at Hinton just outside of the southern end of the project study area collected from the New River during a 1993 Water Quality Monitoring study (Sullivan 1993).

Results from sampling on the New River near Hinton behind the NRGNR Visitor Center (Site 01M) suggest acceptable levels of fecal coliform with occasional fluctuation. Since public access to the New River is provided by the NPS at this site, the potential for human exposure to water-borne pathogens warrants continued monitoring (Sullivan 1993).

Sampling at Madam Creek (Site 02T) produced some of the highest fecal coliform bacteria levels found in the NRGNR. Poor, failing and/or absent sewage treatment systems (raw sewerage was sometimes observed at this site) are contributing a steady amount of sewage when weather conditions are dry or wet. Based on 1993 and past data, Madam Creek could present health risks due to wastewater as this tributary carries relatively high concentrations of fecal coliform bacteria into the New River. It is likely that this stream is being adversely affected more by the communities within its watershed (particularly Brooklin) than by natural contributions (Sullivan 1993).

TABLE 4.3.K FECAL COLIFORM LEVELS FOR SELECTED SITES ON THE NEW RIVER WITHIN AND ADJACENT TO THE PROJECT STUDY AREA							
Site Number	Site Name	Fecal Coliform Levels per 100ml of Sample					
		5/93	6/93	7/93	8/93	9/93	10/93
01M	New River near Hinton, NRGNR Visitor Center	27	33	34	43	23	10
02T	Madam Creek	32	9,600	24,500	5,500	1,500	3,360
03M	New River at Sandstone Falls	127	88	15	117	18	24
04M	New River at Sandstone	57	74	46	27	56	34
05T	Lick Creek	40	80	120	88	48	44
Numbers in the table represent fecal coliform bacteria colonies per 100ml of sample taken each month during the study period. The data in the table represent the highest actual values collected for each month; in the event that all values for a particular month were estimated values, the highest estimated value for that month is shown.							

Source: Sullivan 1993.

The sampling site on the New River at Sandstone Falls (Site 03M) is a new sampling site and, although there were no fecal concentration violations, there is not enough flow data nor sampling events to allow confidence in the correlation of the flows with the bacteria concentrations (Sullivan 1993).

Sampling on the New River adjacent to the Sandstone Falls campground found no fecal coliform concentrations above the 200/100ml standard. In the 1980s, this site exceeded fecal coliform standards on several occasions but exceedances declined in the early 1990s. It is possible that

improvements to residential septic systems upstream of this site coupled with improvements to NPS campsites and camping regulations at the campground have contributed to the lowering of fecal coliform concentrations (Sullivan 1993).

Sampling at the Lick Creek stream gauge site (Site 05T) found no fecal coliform concentrations above the 200/100ml standard. Conductivity readings were lower at this site during high flows (spring) and increased throughout the sample period as flow decreased which is normal for most tributaries within the boundaries of the NRGNR (Sullivan 1993).

Table 4.3.L includes raw data for physical and chemical tests of water samples for selected sites in the project study area and for the NRGNR Visitor Center at Hinton just outside of the southern end of the project study area collected from the New River during the 1993 Water Quality Monitoring study. The interpretation of the data on the New River mainstem indicates that bacteria and physical and chemical measurements collected in 1993 are comparable to those collected in previous years. However, the monitoring program has revealed that there is much still unknown about the biological, physical and chemical attributes of water resources in the NRGNR. More study is needed to gain a better understanding of human influences, seasonal trends and baseline conditions of the New River and its tributaries (Sullivan 1993).

Overall, the data shown in Tables 4.3.K and 4.3.L seem to indicate that the water quality of the New River within the NRGNR, during the recreation season, is relatively good. Fecal coliform rates at Madam Creek are an ongoing problem. Risks to water recreationists from fecal coliform bacteria would occur in the spring during normal to high flows, or after prolonged heavy precipitation events. As stated earlier, fecal coliform bacteria is not always a superior indicator of the presence or absence of pathogens; high bacteria levels do indicate high concentrations of sewage and/or animal wastes and the associated disease agents, but low bacteria levels do not necessarily indicate the absence of pathogenic organisms (Sullivan 1993).

The results of the benthic macroinvertebrate survey include descriptions of each study site which offer greater insight to quality individual streams. As only two USGS designated perennial streams were surveyed (Brooks Branch on the east side of the New River and Big Branch on the west side of the river), mean HBI tolerances are not available for all perennial streams. As shown in Table 4.3.M, mean HBI tolerances for the two USGS designated perennial streams have the lowest values of all of the streams tested. For each taxa, Hilsenhoff Biotic Index (HBI) tolerances were noted and shown as "HBI tolerances" in the Marshall survey (1995). Hardness, pH, dissolved oxygen and conductivity were measured at 15 of 24 sites as indicators of water quality.

Several tributaries of the New River have not been sampled in several years, or not at all. Some of these tributaries were reported by WVDNR to be of high water quality and, therefore, were not included in the NRGNR's water quality monitoring program. Other sites were once

monitored by the NPS but were dropped from the program because of a consistent pattern of good water quality (Sullivan 1993). With the exception of Madam Creek, which has been shown to have high levels of organic (i.e., fecal coliform) pollutants, it is assumed based upon data presented in Tables 4.3.K, 4.3.L and 4.3.M that the New River and all perennial streams in the project study area are high quality waters.

TABLE 4.3.L RAW DATA FOR 1993 PHYSICAL/CHEMICAL TESTS FOR SELECTED SITES ON THE NEW RIVER WITHIN AND ADJACENT TO THE PROJECT STUDY AREA												
Site #	Site Name	Date	Water Temp (C)	Air Temp (C)	PH	Turb (NTU)	DO (mg/l)	Cond	Alka	Al (mg/l)	Mn (mg/l)	Total Fe (mg/l)
01M	New River	6/93	26.0	25.0	8.1	7.3	8.00	16.0	49.0	0.011	0.105	0.035
	NRGNR	8/93	27.0	25.0	7.7	2.8	6.90	180.0	56.0	0.037	0.066	0.135
02T	Madam Creek	6/93	24.0	27.0	8.4	10.3	8.40	210.0	84.0	0.023	0.056	0.059
		8/93	24.0	25.0	7.7	15.0	5.60	450.0	152.0	0.051	0.431	0.176
		10/93	11.0	14.0	8.1	1.7	DA	219.0	111.0	0.047	0.082	0.111
03M	New River at Sandstone Falls	6/93	26.0	28.0	8.8	6.5	8.00	152.0	51.0	0.013	0.075	0.047
		8/93	27.0	28.0	8.4	3.3	7.50	173.0	59.0	0.050	0.066	1.232
		10/93	15.0	14.0	8.4	3.0	DA	151.0	69.0	0.030	0.045	0.130
04M	New River at Sandstone	6/93	27.0	28.0	8.6	4.4	8.30	153.0	48.0	0.015	0.074	0.037
		8/93	26.0	28.0	8.0	4.1	7.20	172.0	56.0	0.046	0.078	0.325
		10/93	15.0	13.0	8.5	1.7	DA	150.0	66.0	0.024	0.037	0.126
05T	Lick Creek	6/93	24.0	28.0	9.1	1.5	8.80	250.0	72.4	0.011	0.024	0.027
			24.0	29.0	8.2	3.0	9.10	400.0	51.0	0.036	0.069	0.080
			11.0	12.0	8.2	0.8	DA	289.0	117.0	0.017	0.056	0.047

Turb = Nephelometric turbidity units; DO = Dissolved oxygen; Cond = Conductivity; Alka = Alkalinity; Al = Aluminum; Mn = Manganese; Total Fe = Total iron.

DA denotes where data were absent for that parameter.

Source: Sullivan 1993.

TABLE 4.3.M WATER QUALITY DATA FOR SELECTED PERENNIAL AND INTERMITTENT STREAMS IN THE PROJECT STUDY AREA (See Figures 4.4.a, 4.4.b and 4.4.c)						
Map I.D.	Stream Name or Location	Avg. t (HBI)	Hard (mg/l)	pH	DO (mg/l)	Cond (mhos)
Perennial Stremas Draining Land on the East Side of the River						
E-P1	Lick Creek	--	--	--	--	--
E-P2	Unnamed stream south of Lick Creek**	4.85	51	7.4	11.4	80
E-P3	Laurel Creek	--	--	--	--	--
E-P4	Unnamed stream in vicinity of Sandstone Falls**	3.76	16	7.7	11.5	25
E-P5	Unnamed stream near southern tip of Brooks Island	--	--	--	--	--
E-P6	Unnamed stream just south of Brooks Island**	4.71	49	7.5	11	80
E-P7	Owens Branch	--	--	--	--	--
E-P8	Collins Hollow**	4.47	33	8	12.2	50
E-P9	Brooks Branch** (reference or control stream)	3.68	20	7.9	11.2	30
E-P10	Unnamed stream north of Tug Rapids**	4.29	n/a	n/a	n/a	n/a
E-P11	Tug Creek	--	--	--	--	--
E-P12	Unnamed stream within Hinton city limits	--	--	--	--	--
Perennial Streams Draining on the West Side of the New River						
W-P1	Madam Creek	--	--	--	--	--
W-P2	Unnamed stream just north of Madam Creek**	4.04	50	7	12.3	48
W-P3	Unnamed stream between Brooks Falls and Tug Rapids**	4.38	37	7.5	12.7	60
W-P4	Unnamed stream across New River from Barksdale**	3.94	30	7	12.3	48
W-P5	Big Branch** (reference or control stream)	3.73	23	8	11.2	40
W-P6	Unnamed stream near southern tip of Brooks Island**	4.00	48	7.9	10.9	80
W-P7	Kates Branch	--	--	--	--	--
W-P8	Mill Branch	--	--	--	--	--
W-P9	Fall Branch	--	--	--	--	--
W-P10	Unnamed stream north of Long Bottom and Fall Branch**	3.86	n/a	n/a	n/a	n/a
W-P11	Unnamed stream between Sandstone Falls & Fall Branch**	3.93	n/a	n/a	n/a	n/a
W-P12	Unnamed stream south of Sandstone Falls**	3.75	n/a	n/a	n/a	n/a
W-P13	Unnamed stream north of Sandstone Falls**	4.00	n/a	n/a	n/a	n/a
W-P14	Unnamed stream near northern tip of Richmond Island**	4.07	n/a	n/a	n/a	n/a

TABLE 4.3.M WATER QUALITY DATA FOR SELECTED PERENNIAL AND INTERMITTENT STREAMS IN THE PROJECT STUDY AREA (Continued)						
Map ID.	Stream Name or Location	Avg. t (HBI)	Hard (mg/l)	pH	DO (mg/l)	Cond (mhos)
Intermittent Streams Draining Land on the East Side of the River						
E-I1	Unnamed stream near Sandstone*	5.13	47	8	11.5	75
E-I2	Unnamed stream near Bass Lake*	4.47	56	8	12.2	92
E-I3	Brier Branch*	4.73	n/a	n/a	n/a	n/a
E-I4	Unnamed stream in Hinton	-	-	-	-	--
Intermittent Streams Draining Land on the West Side of the River						
W-I1	Unnamed stream at Tug Rapids*	6.00	51	7.4	11	83
W-I2	Unnamed stream north of Tug Rapids*	5.00	35	6.9	11.4	60
W-I3	Jerrys Hollow*	4.30	27	7.7	11.1	48
W-I4	Unnamed stream near Long Bottom*	4.67	n/a	n/a	n/a	n/a
W-I5	Unnamed stream near Sandstone Falls*	5.00	n/a	n/a	n/a	n/a
W-I6	Unnamed stream north of I-64 Bridge (not crossed)	-	--	--	-	-
Perennial and intermittent streams which were examined as part of the benthic macroinvertebrate study are noted with a single asterisk (*); streams which were examined and found to be perennial based on study methodology are noted with a double asterisk (**); streams not studied as part of Marshall's Intermittent Stream Survey (1995) are noted with a dash (--). Avg. t (HBI) = mean Hilsenhoff Biotic Index tolerance; Hard = Hardness; DO = Dissolved oxygen; Cond = Conductivity. As a very gross indicator of water quality, it can be assumed that communities having a mean HBI tolerance value less than 5 are dominated by intolerant taxa and probably have high water quality; communities with a mean tolerance of 5 or greater are dominated by taxa with high pollution tolerance and likely have lower water quality.						

Source: Marshall 1995.

4.3.4.3 Potential Direct Impacts

The primary direct water quality impacts associated with project construction are erosion and sedimentation of streams and the New River, and the discharge of pollutants into the New River and streams during project construction. These impacts will result from clearing and grubbing, earthmoving and grading activities, excavation of foundations, and installation of bridges and culverts. Impacts include increased turbidity, concentrations of suspended solids and sediment

deposition. These impacts can in turn affect the domestic and recreational use of water resources, visual and aesthetic quality, and terrestrial and aquatic habitat.

Project construction will cause soil to erode and sedimentation to occur, especially on steep slopes where the natural cover is disturbed. Alternative 3 requires extensive excavation along portions of its alignment, Alternatives 2, 3 and 4 require a bridge or bridges to cross the New River, and Alternatives 2, 3 and 4 require bridges and/or culverts to cross perennial and intermittent streams. Implementation of erosion and sedimentation controls will help minimize the effect of erosion and sedimentation on water quality. After construction is completed and the area is successfully revegetated or soils are otherwise protected, erosion rates are expected to decrease to near or below preconstruction levels in the project study area. Alternative 3 may be the exception to this scenario as erosion and sedimentation could continue after construction is completed on Chestnut Mountain due to the presence of steep slopes and highly erodible soils. These impacts can be minimized with proper protection of steep slopes during and after construction.

Removal of existing bridges and culverts, renovation of existing bridges and culverts, and construction of bridges, culverts and the roadway in the vicinity of streams could result in the disturbance of existing streamside vegetation and could alter the existing tree canopy near streams. Disturbance of streamside vegetation will increase erosion and sedimentation, alter stream microclimates, and impact existing terrestrial and aquatic plant and animal habitat in and adjacent to streams.

Table 4.3.N indicates direct impacts to streamside vegetation by project construction where proposed work diverges from the existing roadway or where project construction will otherwise have an impact on adjacent vegetative cover. The No-Build Alternative is not included in Table 4.3.N as this project alternative will have no construction related impacts on streamside vegetation.

Alternatives 2A and 2C will directly impact streamside vegetation at nine streams, Alternatives 2B, 4A and 4C will directly impact streamside vegetation at eight streams, Alternative 4B will directly impact streamside vegetation at seven streams and Alternative 3 will directly impact streamside vegetation at six streams.

Installation of entirely new culverts in existing streams will impact the streambed and associated streamside vegetation. In areas where existing culverts must be replaced, the placement of new culverts will also temporarily increase erosion and sedimentation over that of existing conditions, especially in areas of steep and highly erodible soils. Round culverts will impact streams by changing flows and substrate. Three-sided, bottomless culverts will result in fewer direct impacts to streams where they are used since the stream bottom will be minimally disturbed.

TABLE 4.3.N DIRECT IMPACTS TO STREAMSIDE VEGETATION FOR BUILD ALTERNATIVES IN THE PROJECT STUDY AREA

Map I.D./Stream	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
East Side							
E-P2/Unnamed stream	YES	n/a	n/a	YES	YES	n/a	n/a
E-P4/Unnamed stream	n/a	n/a	n/a	YES	n/a	n/a	n/a
E-P12/Unnamed stream	n/a	n/a	n/a	n/a	YES	YES	YES
E-I3/Brier Branch	n/a	n/a	n/a	n/a	YES	YES	YES
West Side							
W-I1/Unnamed stream	YES	YES	YES	YES	n/a	n/a	n/a
W-I2/Unnamed stream	YES	YES	YES	YES	n/a	n/a	n/a
W-P5/Big Branch	YES	YES	YES	YES	n/a	n/a	n/a
W-P6/Unnamed stream	YES	YES	YES	YES	YES	YES	YES
W-P7/Kates Branch	YES	YES	YES	n/a	YES	YES	YES
W-P8/Mill Branch	YES	YES	YES	n/a	YES	YES	YES
W-P11/Unnamed stream	YES	YES	YES	n/a	YES	YES	YES
W-P13/Unnamed stream	YES	YES	YES	n/a	YES	YES	YES
W-P14/Unnamed stream	n/a	n/a	YES	n/a	n/a	n/a	YES
Total Impacts to Perennial and Intermittent Streams	9	8	9	6	8	7	8
n/a denotes that project alternative does not cross stream.							

4.3.4.4 Potential Secondary and Cumulative Impacts

Sediments and other pollutants transported in surface water runoff during parkway operation and maintenance could adversely impact the water quality of the New River and perennial and intermittent streams, and terrestrial and aquatic plant and animal habitat. In addition to sedimentation and pollutant transport, changes to stream flows, light and temperature regimes, and the loss of streamside habitat will adversely affect water quality downstream. Prior to implementation of the project, all practicable ways to minimize the effects of sediments and other pollutants on streams will be explored.

With installation of bridges and bottomless culverts at stream crossings, the impacts of project alternatives on streams can be minimized because the hydrologic and biologic functions of streams would be similar to existing conditions. Improvement in these functions is possible over the long term.

Earth-disturbing activities associated with new development spurred by the parkway in the project study area will impact existing land cover and vegetation, and could adversely impact water quality. Sediment removed and transported from the land surface via overland runoff will be the principal pollutant associated with earth-disturbing activities.

Water quality problems related to the occurrence of unacceptable fecal coliform levels stemming from poorly functioning sewage treatment systems and the inappropriate disposal of human wastes have been documented in the project study area, and have the potential to increase with new development in the project study area and the immediate vicinity. If water quality is diminished in the New River and in perennial and intermittent streams, recreational use of these water resources will be affected. Adverse impacts to the aesthetic and recreational resources in the project study area, in turn, will degrade the experience of a scenic parkway and the NRGNR.

Petroleum products and chemicals associated with parkway operation and maintenance could enter the New River and streams in the project study area resulting in the degradation of water quality. Impervious road surfaces and adjacent soil surfaces accumulate heavy metals, polychlorinated biphenyls (PCBs), herbicides, oil, grease and other hydrocarbons from vehicles that can be washed into streams and the New River. Project alternatives located immediately adjacent to the New River (Alternative 2 and portions of Alternatives 3 and 4) and project alternatives which cross streams (all alternatives including the No-Build) have the potential to allow roadway pollutants to be washed directly into these water resources.

Considering the projected increase in average daily traffic (ADT) for Build Alternatives, it is anticipated that impacts to water quality from roadway pollutants will increase with the operation and maintenance of a Build Alternative. However, research by Maestri et al. (1981) indicates that few substantial effects from highway runoff are apparent for highways with ADT's of less than 30,000 vehicles per day while toxic effects are limited to urban highways with greater than 50,000 ADT. The ADT for a parkway to be constructed along Route 26 on the west side of the river is projected to increase by 713 percent (750 ADT to 6,100 ADT) from 1994 to 2014 while the ADT for a parkway to be constructed along WV 20 on the east side of the river is projected to increase by 188 percent (2,500 ADT to 7,200 ADT) from 1994 to 2014. Thus, total traffic counts projected for project alternatives in the project study area are low (6,100 to 7,200 ADT) as compared to a high traffic highway (>50,000 ADT), and the impacts on water quality are expected to be low. Nevertheless, because of the desire to protect high quality waters in the project study area, all practicable means to minimize the impact of roadway pollutants will be undertaken during final design, construction, operation and maintenance.

With implementation of the project, the NRP LMS will assist local governments in guiding change within the parkway corridor. The LMS includes performance standards which address earth-disturbing activities and associated site runoff which could impact water quality. As currently drafted, the compatibility assessment review process contained in the LMS requires developers to indicate the extent of site impacts along with measures they will undertake to minimize site impacts and protect water quality. Provisions in the LMS require developers to maintain a 15-meter (50-foot) wide buffer of vegetation between disturbed ground, and designated streams and wetlands in an effort to protect water quality.

All Build Alternatives will be accompanied by the LMS and will benefit from the compatibility assessment review process and specific performance standards that address water quality protection. The No-Build Alternative will not be accompanied by the LMS and will not benefit from LMS performance standards designed to protect water quality. Excluding Hinton from the calculations of land shown as suitable for development in the project study area, Alternative 2A provides LMS coverage to the highest amount of land suitable for development in the project study area (52 percent) while Alternative 3 provides the lowest amount of LMS coverage to land suitable for development (35 percent) (see Table 5.2.D in Section 5.2 Land Use). Therefore, potential secondary water quality impacts related to new development in the project study area will be of greatest concern for Alternative 3 where the LMS will cover the least amount of land suitable for development outside of Hinton in the project study area.

If Alternative 3 or 4 is selected as the preferred alternative, Route 26 (north or south of Cochran Cemetery depending on the alternative) will remain at its current level of service. It is predicted that traffic concerns north of Cochran Cemetery to Sandstone Falls or south of Cochran Cemetery to Brooklin on the west side of the New River would be addressed at some future time through improvements to those portions of Route 26. Improvements to the remaining unimproved portions of Route 26 would require earth-disturbing activities and drainage channel alteration that could adversely impact water quality and could induce new development along the road. This new development would not be covered by the water quality protection performance standards included in the LMS.

Cumulative impacts on water quality in the project study area would occur in relation to the No-Build Alternative if Route 26 is improved to New River Parkway (NRP) roadway design standards between Brooklin and Sandstone Falls [a total distance of approximately 14.5 kilometers (nine miles)]. Alternatives 3 and 4 also have the potential for cumulative impacts related to water quality if Route 26 is improved to NRP roadway design standards between the bridge crossing near Cochran Cemetery north to Sandstone Falls [a total distance of approximately 6.4 kilometers (four miles)] or from Cochran Cemetery south to Brooklin [a total distance of approximately 7.4 kilometers (4.6 miles)].

4.3.4.5 Potential Mitigations

To mitigate impacts to water quality, disturbed areas will be regraded and revegetated to aid in the retention of site runoff, thus reducing the potential for the off-site movement of sediment and pollutants through surface transport. Wherever possible, a filtering buffer of vegetation between the roadway and the New River will be preserved or planted. The provision of a vegetative buffer in these areas will aid in preventing pollutants and toxins from being directly transported into the river via surface runoff. Filtering runoff through grassed swales, sediment basins and/or created wetlands will help improve the quality of runoff entering streams and the New River.

During construction of bridges and installation of culverts, disturbance to existing vegetation along streams will be avoided or minimized. Any vegetation that cannot be avoided will be replaced using species appropriate for the altered condition. Indigenous plantings will be used whenever practicable and appropriate.

Parkway construction impacts to water quality related to erosion and sedimentation, including chemical, trash and human waste transport, will be minimized through the use of temporary and permanent erosion and sediment control measures and other regulations as described in the *West Virginia Department of Transportation, Division of Highways: Erosion and Sediment Control Manual* (WVDOT 1995c). Such measures include properly installing and maintaining portable toilets at construction sites, minimizing the removal of existing vegetation, restricting the areas where heavy equipment may maneuver, promptly cleaning up and reestablishing all construction areas, and quickly reestablishing vegetation cover on exposed soils. Construction staging areas will be located in areas away from the New River, streams and wetlands to minimize the chance for sedimentation and the input of other pollutants into surface waters. Check dams, silt fences, diversion channels, earth berms and sediment containment structures will be used to collect sediment and other potential pollutants.

Since water quality impacts resulting from increases in impervious surfaces and ADT volumes associated with the Build Alternatives are not known at this time, the formulation and implementation of a water quality management program for the parkway could be used to identify and monitor adverse water quality impacts. Because of existing concerns about water quality within the project study area, the project will be used as a vehicle to encourage greater cooperation of federal, state and local agencies to cooperate in preparing specific plans to provide for wastewater treatment facilities and water quality protection programs. As localities in the project study area have limited capital for building additional water treatment or water quality protection infrastructure, federal and state assistance will be very important if water quality is to be maintained in the project study area.

For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.4 WETLANDS

In 1986, the New River and its associated aquatic, wetland and riparian habitat areas were classified by the United States Department of Interior (USDOI), Fish and Wildlife Service (FWS) as Resource Category 1, in accordance with FWS Mitigation Policy (*Federal Register*, 46(15): January 23, 1981). The habitats of the New River are of high value for evaluation species, and are unique and irreplaceable on a national basis or in the ecoregion section. The mitigation goal for Resource Category 1 habitat is no loss of existing habitat value; all losses of existing habitat are to be prevented as these areas cannot be replaced. Guidelines promulgated by the FWS under Resource Category 1 designation provide for insignificant changes provided they will have no significant impact on habitat value.

4.4.1 Riverine and Palustrine Wetlands

In the *New River Parkway Wetland Technical Report* (WVDOT 1994a, p. 1-3), the following description is offered:

The wetlands in the project area include the New River itself plus adjacent areas that are subject to periodic inundation or saturation. In addition, a few wetland areas of small size are associated with feeder drainages.

The New River in the area surveyed is predominantly a broad shallow river with few islands interspersed throughout. The watercourse has several rapids, riffles, large and small pools, and a waterfall. Thus there is a wide variety of aquatic habitats, most having distinctive vegetation. The portions of the project area considered to be wetlands can be divided into two systems according to the Cowardin classification method: Riverine and Palustrine. The boundary between the two was determined by the persistence of the vegetation; the Riverine wetlands having nonpersistent vegetation and the Palustrine wetlands having persistent vegetation.

Riverine wetlands in the area are considered to be part of the subsystem 'Upper Perennial' due to the velocity of the water, the nature of the river bottom, and high dissolved O₂ concentrations. Within this subsystem, five classes of wetland are present: Unconsolidated Bottom, Aquatic Bed, Unconsolidated Shore, Rocky Shore, and Emergent. These divisions are based on substrate type and vegetation type.

Palustrine wetlands in this area are delineated by the presence of persistent wetland vegetation, upslope from the Riverine wetlands. Classes of wetland within the Palustrine areas are Emergent, Scrub/Shrub, and Forest. All classes are considered to be temporarily flooded and dominated by broad-leaved deciduous plants.

Riverine wetlands are typically located in or adjacent to streams and rivers in lower physiographic positions of the landscape. Palustrine wetlands may occur isolated from or adjacent to streams, rivers and ponds in higher physiographic positions of the landscape.

A list of wetland flora and the dominant wetland species associated with each class is presented in the Wetland Technical Report (WVDOT 1994a). Analyses of wetland types (palustrine-forested, scrub-shrub, emergent; and riverine) are provided where alternative road alignments are shown in close proximity to wetland areas. Project alternatives typically pass close to wetland areas along much of the west side of the river.

4.4.1.1 Methodology

Aerial photographs (1:1,200 scale) and topographic segment maps (1:4,800) were used to compile preliminary locations of wetlands. Field studies were conducted by the DOH during the spring and summer of 1991, October 1993 and the spring and summer of 1994. Transects were established by the DOH during late spring 1994 in order to make preliminary wetland boundary determinations on both sides of the New River (WVDOT 1994b). Aerial photographs (1:6,000) and detailed plans (ranging in scale from 1:4,800 to 1:600) were used by the DOH to map wetlands in those areas where project alternatives appeared close to existing wetlands.

On June 14, 1994, a field review was held with participants from the United States Army Corps of Engineers (COE), EPA, FWS, NPS, WVDEP-OWR, Federal Highway Administration (FHWA), DOH, New River Parkway Authority (NRPA) and consultants. Agency representatives attending the field review expressed general agreement with the methodologies used by DOH for the preliminary mapping of wetlands.

The SCS (now the NRCS) and WVDNR, unable to attend the wetland field review, were sent detailed meeting notes and all agencies were asked to send responses if issues discussed in the field needed to be clarified. In letters sent to the DOH, several agencies expressed reservations about using the annual flood level and/or the ordinary high water mark to determine wetland boundaries. There were also several comments regarding the sensitivity of island habitats. The central concern expressed by agency representatives was the need to avoid wetland impacts (Buckley 1994; Kennedy 1994; Taylor 1994).

In an effort to avoid direct impacts to wetlands and the New River, the annual flood level was used by the design engineer during preliminary roadway design as an estimate of the upper limits of the riverine wetlands. The annual flood level was not used to determine wetland boundaries, rather wetland boundaries have been determined by the DOH through field observations of hydric soils, wetland hydrology and hydrophytic plants, and the use of aerial photography and topographic maps. In addition, ten transects were laid out for more detailed wetland study and the findings documented on wetland determination forms. Information obtained from wetland determinations performed by the DOH (WVDOT 1994a) was subsequently incorporated into the preliminary roadway design database.

After selection of the preferred alternative and prior to the request for COE on-site confirmation, wetland boundaries along the preferred alternative will be delineated using flags or stakes, and draft wetland data forms will be completed along with a designation of wetland types and wetland size estimates. Following on-site confirmation of wetland boundaries by the COE, jurisdictional wetland boundaries will be surveyed and detailed drawings (i.e., plans, cross sections, elevations, etc.) will be submitted to the COE for verification. Upon receipt of COE notification of verification, wetland boundary survey information will be incorporated into the roadway design database. Roadway cross sections which reflect surveyed wetland boundaries in relation to the proposed roadway centerline and the roadway template will be utilized during the wetland permitting process.

All practicable measures to avoid wetland impacts will be undertaken during the remaining stages of the planning process, and input from the COE, EPA, FWS, NPS and WVDEP solicited during the process.

4.4.1.2 Affected Environments

Shoreline areas with a mix of riverine and palustrine wetlands greater than 15 meters (50 feet) in width occur within the project study area along both sides of the New River, and on Brooks and Richmond islands (see Figures 4.4.a, 4.4.b and 4.4.c). On the east side of the river, wetlands of this size are found north of the I-64 bridge and extending south to Sandstone Falls, at the toe of Chestnut Mountain (across from Long Bottom), near the Fox Addition, adjacent to Camp Brookside, near the Hinton Sewage Treatment Plant and adjacent to the City of Hinton. On the west side of the river, wetlands greater than 15 meters (50 feet) in width are found near Brooklin and Richmond Bottom, adjacent to Cochran Cemetery and Terreo Farm, and near Sandstone Falls.

The most substantial areas of riverine wetlands are located within the riverbed near Brooklin, Brier Branch, Richmond Bottom and Sandstone Falls. Adjacent to the river, substantial areas of riverine wetlands exist along Brooks Branch and south of Brooks Branch near the Hinton Sewage Treatment Plant. The Camp Brookside, Brooks Falls and Sandstone Falls areas have riverine wetland areas mixed with palustrine wetlands.

The three largest concentrations of palustrine wetlands are located adjacent to the New River near Sandstone Falls on the west side, below Brooks Island, and south of Brooks Branch on the east side. Smaller areas of palustrine wetlands can be found at the mouth of Falls Branch on the west side, northwest of Brooks Island and along a narrow strip on both sides of the river in the Richmond Bottom area.

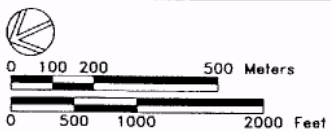
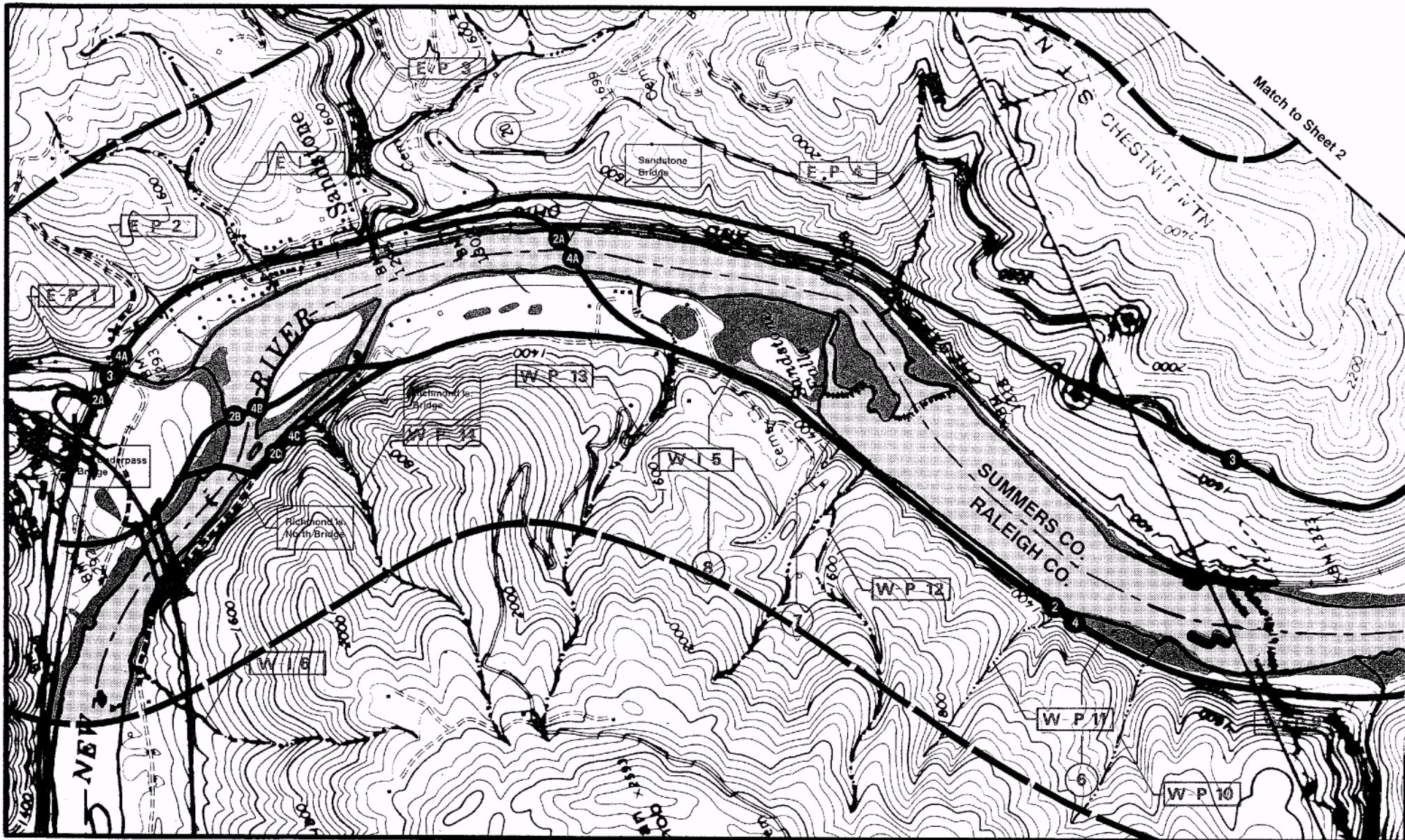
4.4.1.3 Potential Direct Impacts

Potential direct impacts associated with road construction include depositing of fill material into wetlands that "... adversely affect the biological productivity of wetland ecosystems by smothering, dewatering, permanently flooding or altering substrate elevations or periodicity of water movement" (40 CFR 230.41). Depositing fill material into wetlands will result in the direct loss of existing hydrophytic vegetation, possibly changing the character and habitat to one that will support only upland species. Sedimentation as a result of road construction may also have an adverse direct impact to wetlands and wildlife nesting areas located in wetland environments.

Concrete will be placed in the New River and portions of adjacent wetlands at bridge pier footing locations associated with proposed river crossings and fill material (large, clean and hard stone) could temporarily be required for bridge causeway construction. If causeways are required, they will be removed immediately following bridge construction and all efforts made to restore wetland areas and the river bottom to original conditions. It is estimated that causeway construction will have no long term effects on wetlands.

The number of bridge piers that will impact the New River and/or adjacent wetlands, and the total area of bridge pier footing impacts associated with each Build Alternative are shown in Table 4.4.A. Bridge pier footings will typically be placed into riverine (aquatic bed or unconsolidated bottom) wetlands except in the case of Alternatives 2B, 2C, 4B and 4C which each require one bridge pier footing to be placed in palustrine (shrub-scrub) wetlands. Table 4.4. A presents information for construction of a *steel girder bridge* at all proposed bridge crossings. However, other options for bridge construction exist that could reduce or eliminate bridge pier footing impacts to the New River and/or adjacent wetlands, as follows: a *concrete box girder bridge with gantry erection*, a *through arch bridge* and a *cable-stayed bridge*.

Section 4.4.1.5 Potential Mitigations summarizes bridge construction impacts for all bridge construction options considered for the project and depicts the four types of bridges considered for New River crossings. Bridge construction options and associated impacts are presented in more detail in Appendix H: Water Resources - Stream Crossing Details and Bridge Construction Options.



1 CROSS-SECTION LOCATION
(see fig. 4.4.d & 4.4.e)

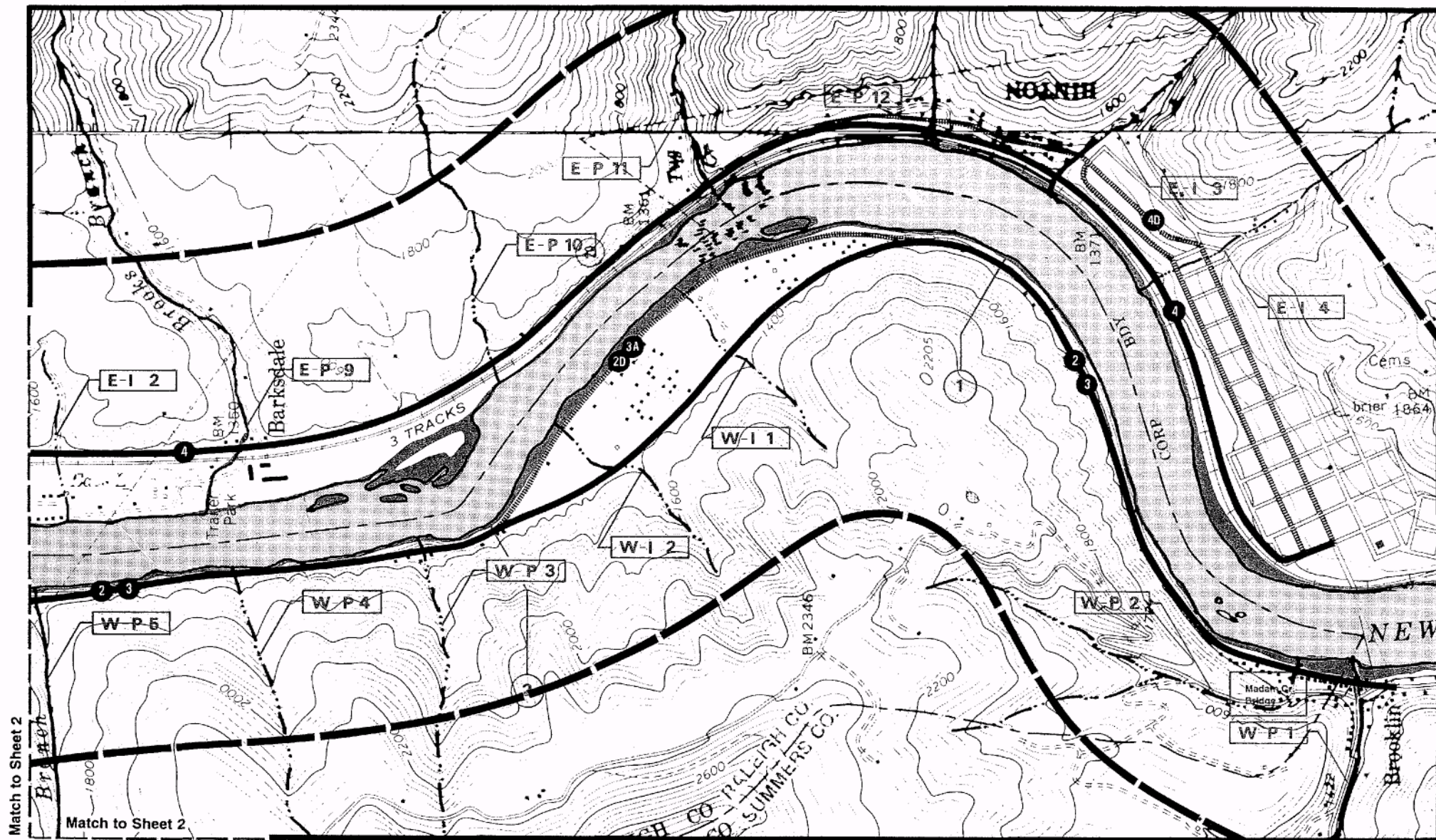
RIVERINE
WETLAND

PALUSTRINE
WETLAND

W-P 1 PERENNIAL STREAM

W-I 1 INTERMITTENT STREAM

WETLANDS/STREAMS
New River Parkway Northern Section
West Virginia Sheet 1 Fig. 4.4.e



0 100 200 500 Meters
0 500 1000 2000 Feet

1 CROSS-SECTION LOCATION
(see fig. 4.4.d & 4.4.e)

RIVERINE
WETLAND

PALUSTRINE
WETLAND

W-P 1 PERENNIAL STREAM

W-I 1 INTERMITTENT STREAM

WETLANDS/STREAMS
New River Parkway Northern Section
West Virginia Sheet 3 Fig. 4.4.c

TABLE 4.4.A NEW BRIDGE LOCATIONS AND BRIDGE CONSTRUCTION IMPACTS TO THE NEW RIVER AND ADJACENT WETLANDS FOR BUILD ALTERNATIVES IN THE PROJECT STUDY AREA (STEEL GIRDER BRIDGE OPTION)							
	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
Bridge Across Wetlands at I-64 Underpass							
Bridge piers in wetlands	n/a	0	0	n/a	n/a	0	0
Bridge Across New River North of Richmond Island							
Bridge piers in river/wetlands	n/a	n/a	3	n/a	n/a	n/a	3
Total area of bridge pier footings in river/wetlands	n/a	n/a	0.03 ha (0.07 ac)	n/a	n/a	n/a	0.03 ha (0.07 ac)
Area of temporary causeway in river/wetlands	n/a	n/a	0.02 ha (0.06 ac)	n/a	n/a	n/a	0.02 ha (0.06 ac)
Duration of construction in river	n/a	n/a	24 mo	n/a	n/a	n/a	24 mo
Bridge Across New River at Richmond Island (2)							
Bridge piers in river/wetlands	n/a	4	n/a	n/a	n/a	4	n/a
Total area of bridge pier footings in river/wetlands	n/a	0.04 ha (0.09 ac)	n/a	n/a	n/a	0.04 ha (0.09 ac)	n/a
Area of temporary causeway in river/wetlands	n/a	0.03 ha (0.08 ac)	n/a	n/a	n/a	0.03 ha (0.08 ac)	n/a
Duration of construction in river	n/a	24 mo	n/a	n/a	n/a	24 mo	n/a
Bridge Across New River South of Sandstone							
Bridge piers in river/wetlands	3	n/a	n/a	n/a	3	n/a	n/a
Total area of bridge pier footings in river/wetlands	0.03 ha (0.07 ac)	n/a	n/a	n/a	0.03 ha (0.07 ac)	n/a	n/a
Area of temporary causeway in river/wetlands	0.08 ha (0.19 ac)	n/a	n/a	n/a	0.08 ha (0.19 ac)	n/a	n/a
Duration of construction in river	24 mo	n/a	n/a	n/a	24 mo	n/a	n/a
Bridge Across New River South of Brooks Island							
Bridge piers in river/wetlands	n/a	n/a	n/a	5	5	5	5
Total area of bridge pier footings in river/wetlands	n/a	n/a	n/a	0.05 ha (0.12 ac)	0.05 ha (0.12 ac)	0.05 ha (0.12 ac)	0.05 ha (0.12 ac)
Area of temporary causeway in river/wetlands	n/a	n/a	n/a	0.10 ha (0.25 ac)	0.10 ha (0.25 ac)	0.10 ha (0.25 ac)	0.10 ha (0.25 ac)
Duration of construction in river	n/a	n/a	n/a	24 mo	24 mo	24 mo	24 mo
Bridge Across Madam Creek at Brooklin							
Bridge piers in creek/wetlands	0	0	0	n/a	n/a	n/a	n/a
(1) This table presents impact information for construction of a steel girder bridge at specific bridge crossing locations in the project study area. See Table 4.4.B for construction impact information for all bridge construction options. (2) n/a denotes that a particular project alternative does not include the designated bridge.							

Source: WVDOT 1995a.

Alternatives 2A, 2B, 2C and 3 include one bridge crossing each, and Alternatives 4A, 4B and 4C include two crossings each. The No-Build Alternative is not included in Table 4.4.A as this project alternative will require no new bridge construction across the New River and will not impact the New River or wetlands in the project study area. Alternative 4B has the greatest bridge pier footing impact on the New River and adjacent wetlands, 872 square meters or 0.09 hectares (9,375 square feet or 0.22 acre), due to its river crossings at Richmond Island and south of Brooks Island.

In order to construct bridges over the New River, temporary fill in wetlands may be required. Under a "worst-case" scenario, using the *steel girder bridge* as the model, fill would be placed into existing wetlands in and along the New River in order to construct temporary causeways. Causeways would likely be built as "islands" to allow the river to flow through them and could remain in the river for as long as 24 months.

The method of constructing bridge pier foundations in riverine wetlands depends on the depth of bedrock at the site. Judging from the many falls and rapids in the New River, bedrock is likely to be close to the bottom of the river bed. This suggests that pier sites should be enclosed with embankment rather than sheet piling because river beds with less than 1.5 meters (five feet) of silt and underlain with bedrock are difficult places to construct sheet piles. Typically, a causeway or embankment would be built on one side of a pier site. The site would then be enclosed by a coffer dam and dewatered. If this procedure is used to construct piers, water from the coffer dam will be pumped to a temporary settling pond in an upland position above the river bank to avoid introducing sediment to the New River and adjacent wetlands.

The duration of construction in the river and wetlands varies from bridge type to bridge type and from alternative to alternative. With bridge types other than the *steel girder bridge*, temporary fill impacts on riverine and palustrine wetlands could be lessened (see Table 4.4.B in Section 4.4.1.5 Potential Mitigations).

Boat access facilities are currently planned for four proposed recreation sites along the east and west sides of the New River in the project study area. Construction of boat launch facilities associated with these sites could impact wetland areas along the shoreline in terms of both direct construction-related impacts and runoff from adjacent construction activities. Wetland impacts associated with recreation facility construction will be quantified upon selection of a preferred alternative and designation of proposed recreation facilities that would accompany the preferred alternative.

Except for wetland fill associated with bridge pier footings and temporary causeways required to construct a bridge or bridges across the New River (Alternatives 2, 3 and 4), and boat launch construction associated with proposed boat access facilities, no other fill into riverine wetlands arising from project construction is anticipated in the project study area. Some impacts to

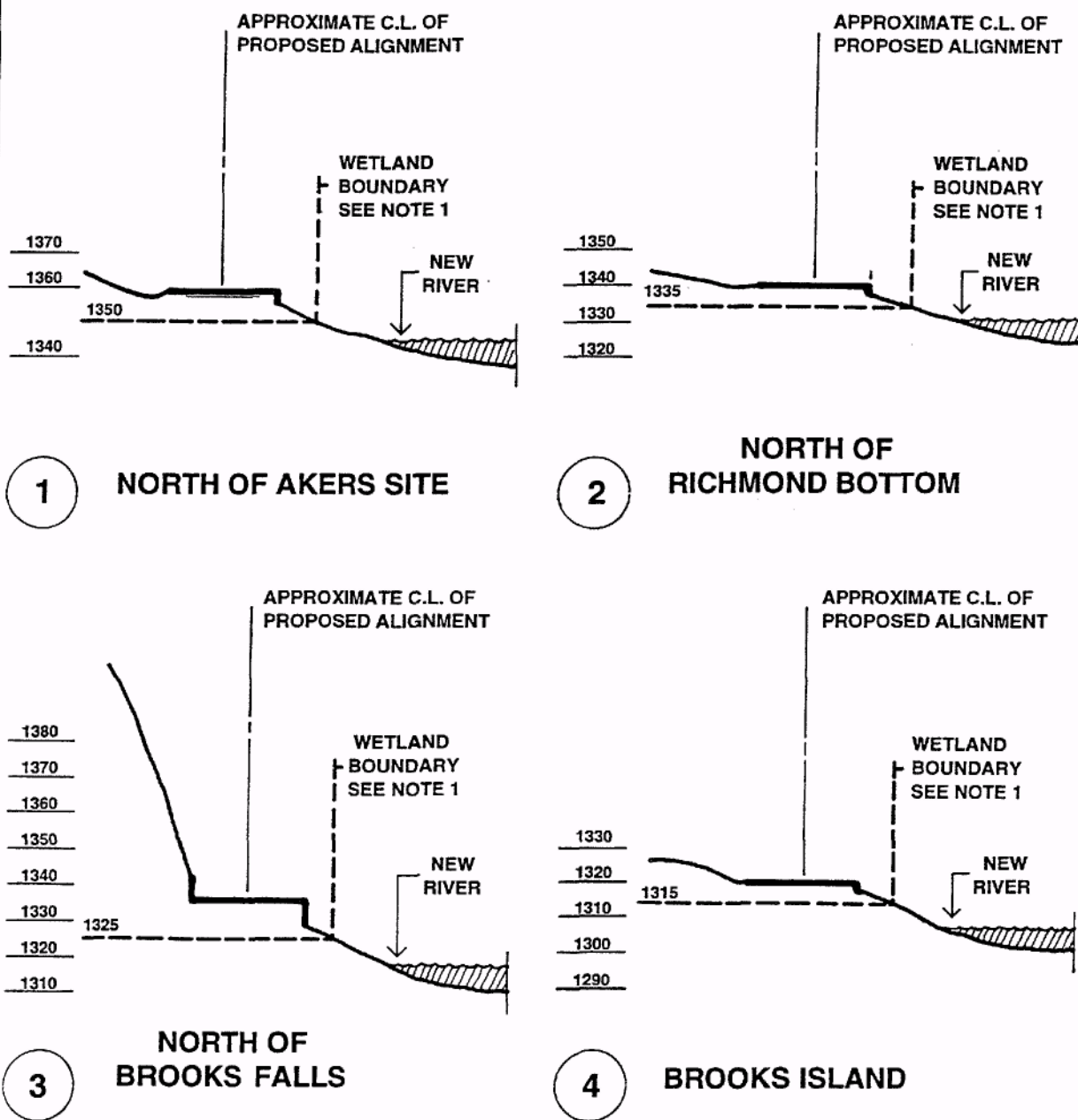
palustrine wetlands may result with roadway and recreation facility construction for Alternatives 2, 3 and 4.

Based on DOH wetland determinations, the design engineer expects that direct riverine wetland impacts will be avoided except where the construction and placement of bridge pier footings occurs, and at proposed boat access facilities. Figures 4.4.d and 4.4.e depict the relationship of the parkway with the DOH-determined wetland boundary at eight critical points along the west side of the New River. These critical points (locations where the proposed parkway will be in close proximity to existing wetlands) were visited and/or discussed with the EPA, COE, FWS, NPS and WVDEP-OWR during the June 1994 wetlands field review. Cross sections shown in Figures 4.4.d and 4.4.e were drawn using preliminary engineering plans as a reference and comparing these preliminary plans with the DOH-determined wetland boundaries as shown in the Wetland Technical Report (WVDOT 1994a).

It is important to note that the DOH-determined wetland boundaries are conservative, with the location of wetland boundaries drawn at the next highest five-foot contour on 1:4,800 topographic maps (WVDOT 1994a). These same elevations have been transferred to the eight cross sections shown in Figures 4.4.d and 4.4.e. As a result, it is likely that the distance between the retaining wall or curb (shown on the New River side of the parkway) and the actual (COE-verified) wetland boundary will likely be greater than what is shown on the cross sections in Figures 4.4.d and 4.4.e. It is impossible, however, to show precise wetland impacts at this stage of project evaluation.

The cross sections thus provide a best estimate of the relationship between proposed retaining walls and/or curbs and DOH-determined wetland boundaries along the west side of the New River. More precise impacts to riverine and palustrine wetlands will be presented during the wetland permitting process prior to project construction, as required by the COE and other reviewing agencies (see Section 10.0 Permit Requirements).

Figure 4.4.d CROSS SECTIONS SHOWING THE RELATIONSHIP BETWEEN THE PROPOSED PARKWAY AND THE WETLAND BOUNDARY AT CRITICAL POINTS ALONG THE NEW RIVER (Sheet 1)

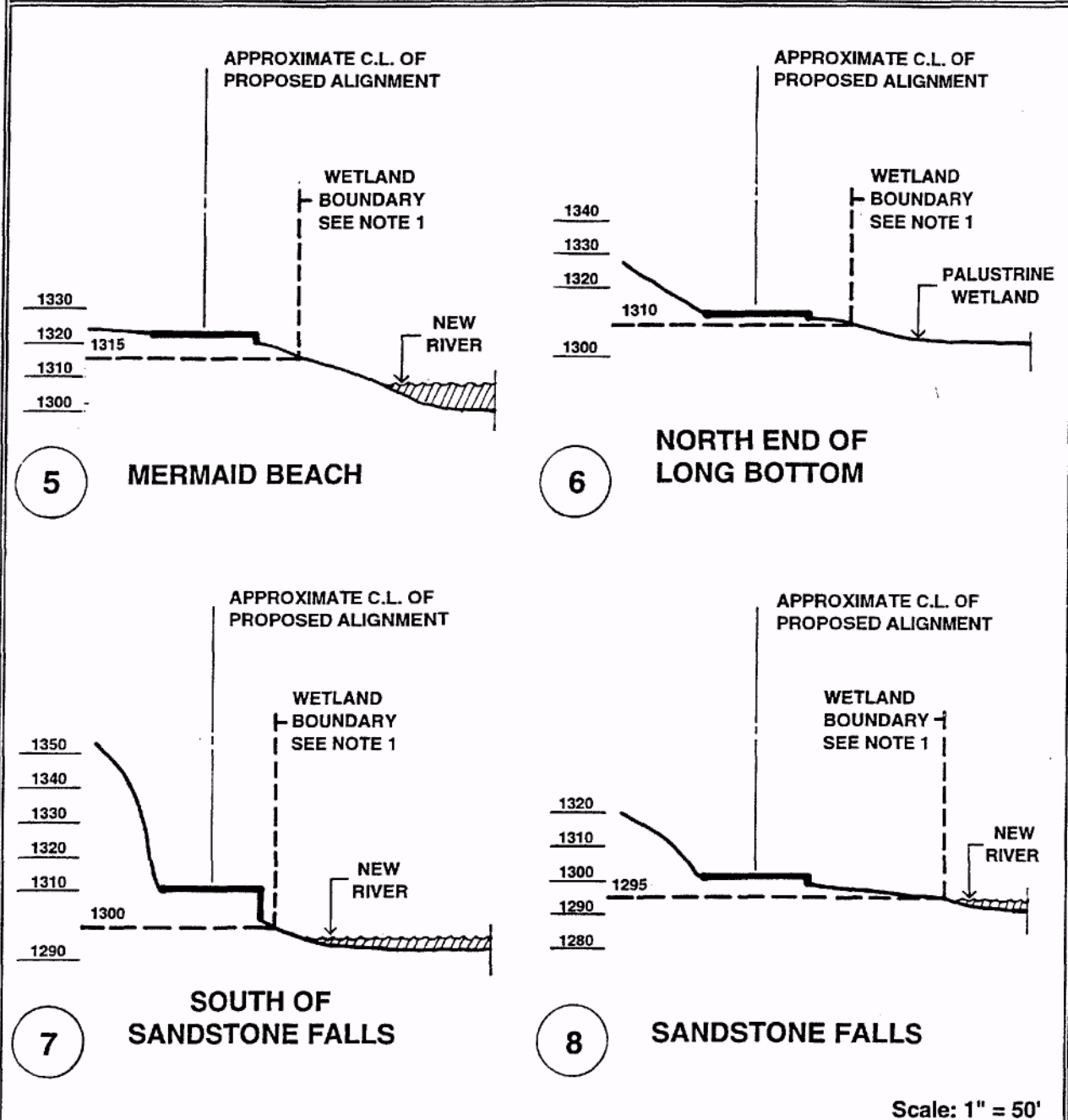


Scale: 1" = 50'

Notes:

- (1) Wetland boundaries are drawn at the next highest five-foot contour, per DOH determination (WVDOT 1994a).
- (2) For road widths, see typical roadway sections, Figure 2.1.a. Cross-sections 1-4 are shown with retaining wall or curb.
- (3) Refer to wetlands/streams maps, sheets 1-3, Figures 4.4.a, 4.4.b and 4.4.c for cross section locations.

Figure 4.4.e CROSS SECTIONS SHOWING THE RELATIONSHIP BETWEEN THE PROPOSED PARKWAY AND THE WETLAND BOUNDARY AT CRITICAL POINTS ALONG THE NEW RIVER (Sheet 2)



Notes:

- (1) Wetland boundaries are drawn at the next highest five-foot contour, per DOH determination (WVDOT 1994a).
- (2) For road widths, see typical roadway sections, Figure 2.1.a. Cross-sections 5-8 are shown with retaining wall or curb.
- (3) Refer to wetlands/streams maps, sheets 1-3, Figures 4.4.a, 4.4.b and 4.4.c for cross section locations.

4.4.1.4 Potential Secondary and Cumulative Impacts

Wetland hydrology can be severely compromised by obstructing circulation patterns, eliminating nutrient exchanges and/or interfering with the filtration function of wetlands. In the project study area, localized impacts could occur as a result of project construction. Any disturbance to the existing hydrology of the wetlands has the potential to adversely affect these ecosystems (FHWA 1985). Of special concern will be any areas where scouring patterns may alter wetlands and/or island habitats. Hydrologic studies will be required to evaluate the influence of bridge pier footings being placed in the New River. It is not anticipated that hydrologic impacts will occur in other areas along the proposed parkway.

Roadway runoff into wetlands can impact wetland areas. As chemicals, heavy metals and other potentially toxic constituents reside in wetland areas that are not frequently inundated by storm and melt water flows, only those wetlands isolated from the New River will likely accumulate pollutants over the long term. Because isolated wetlands are uncommon in the project study area, the build up of toxic constituents in wetland areas is not likely to be a major concern along the parkway (FHWA 1985).

Longer and flatter vegetated slopes have more potential to filter out pollutants before they reach streams and wetlands. Shorter and steeper slopes have greatly reduced pollutant-filtering capabilities.

Alternatives 2, 3 and 4 each have portions of their roadway in close proximity to the New River and thus pollutants in roadway runoff will have a greater chance of directly entering wetlands and the New River without the benefit of vegetative filtration. Sediment traps in catch basins and infiltration beds beneath the road would each help to slow and filter roadway runoff and will be considered in areas where there is minimal distance between the parkway and wetlands or the New River.

As Alternative 3 crosses the steepest terrain (over Chestnut Mountain), this project alternative will likely experience erosion and sedimentation for the longest duration and, without the benefit of vegetated swales, the slopes below this alternative will have reduced capacity for pollutant filtration.

4.4.1.5 Potential Mitigations

Special mitigation measures will be necessary for wetlands and special aquatic habitat sites. The first step in the wetlands mitigations process requires an alternative analysis to identify practicable project alternatives that involve maximum avoidance and minimum impacts pursuant to Section 404(b)(1) guidelines presented in 40 CFR 230.10(a)(3). A project alternative is practicable if it is physically available, capable of being feasibly implemented, cost effective,

would not cause more severe impact to other environmental and socioeconomic resources, and allows the project to perform its intended purpose.

As total wetlands avoidance may not be practicable for all Build Alternatives, compensatory wetlands mitigation will likely be required. Compensatory mitigation will include the following strategies in order of preference pursuant to Section 404(b)(1) guidelines and the memorandum of agreement between the COE and EPA: (1) avoidance; (2) impact minimization; (3) mitigation in-kind, onsite; (4) mitigation in-kind, off-site; (5) mitigation out-of-kind, onsite; and (6) mitigation out-of-kind, off-site. In addition, the following modes of mitigation, listed in order of preference, may be implemented for wetlands mitigation if avoidance and impact minimization are not feasible: (1) wetlands restoration; (2) wetlands creation; and (3) wetlands enhancement. As indicated, only after it is demonstrated that total avoidance and impact minimization are not feasible will other mitigation strategies be considered. The general objective and goal of mitigation includes replacement of functional values and cumulative area of cover types lost due to project implementation.

Avoidance of wetlands through alignment alteration is the primary mitigation measure. Figure 4.4.f illustrates how alignment adjustment and/or retaining wall construction can be used to avoid disturbance to the New River wetland ecosystem. Mitigation measures pertaining to bridge construction will be undertaken to address short-term impacts to wetlands where bridge pier footings must be placed in the river and/or wetlands, and where other roadway construction activities impact wetlands. Mitigation measures will also be undertaken to address long-term impacts to wetlands where secondary or cumulative impacts are of concern. If required, the development and implementation of a mitigation plan will utilize wetlands creation and restoration to offset unavoidable impacts to wetlands and special aquatic habitats.

All reasonable strategies, including the use of clear span bridges such as the through arch and cable-stayed bridges discussed below, will be explored to avoid placing fill in the river during bridge construction. If temporary causeways must be placed in the river and wetlands, appropriate resource agencies will be consulted to determine the most appropriate ways to minimize wetland impacts. Causeways built in the New River and adjacent wetland areas will be constructed of large, clean and hard stone, and the stone will be removed after construction. Bridge construction will occur during lower flow periods and as necessary to minimize the potential for sedimentation and disturbance. If coffer dams are used to de-water areas where piers are constructed, then sediment-laden water will be pumped to a temporary settling pond outside of wetlands to remove suspended particles. As wetland impacts associated with causeway construction will be temporary in nature, disturbed wetlands are expected to return to normal conditions following removal of causeways.

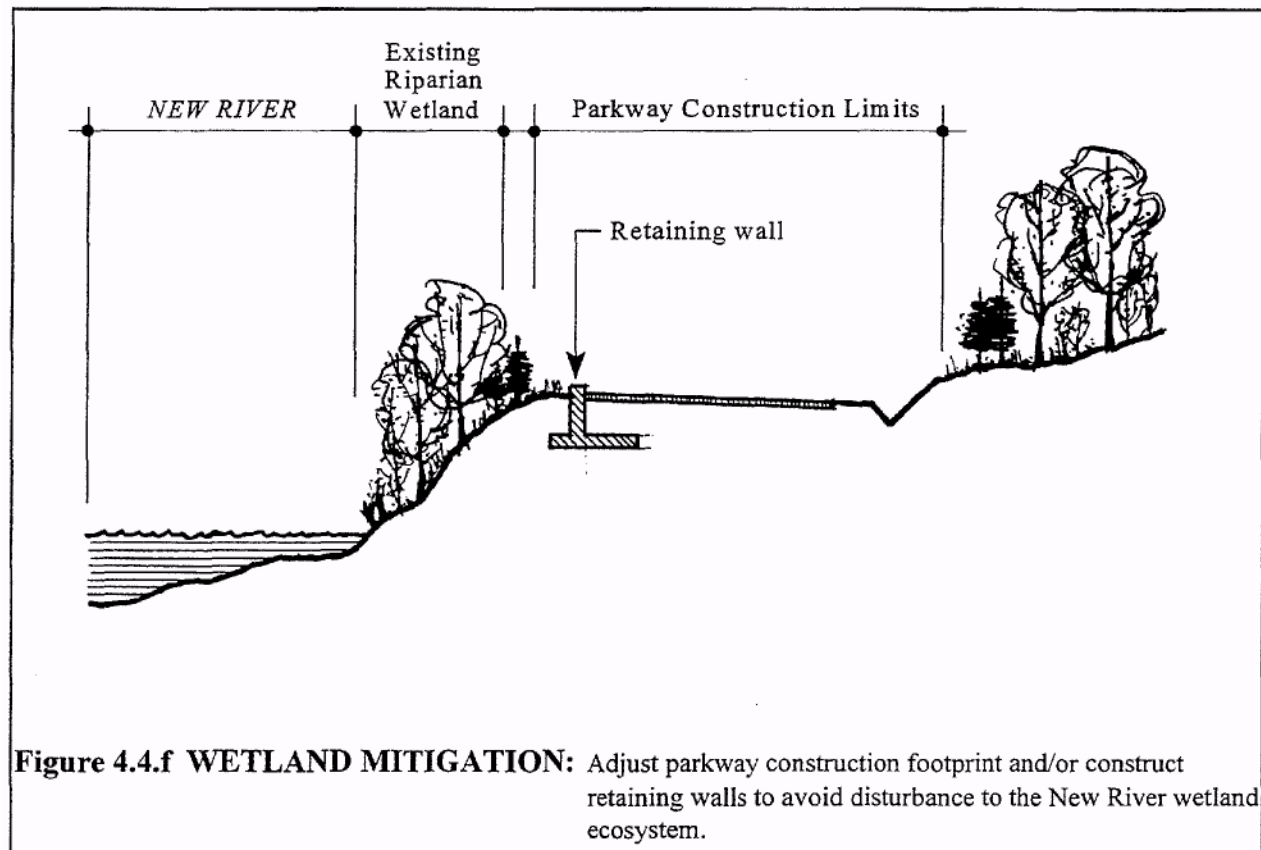


Figure 4.4.f WETLAND MITIGATION: Adjust parkway construction footprint and/or construct retaining walls to avoid disturbance to the New River wetland ecosystem.

Placement of bridge pier footings in the river will be based upon the results of appropriate scouring model evaluations. Scour will occur at all bridge piers to various degrees. Scour action is most active when water levels are high. Bridge piers in the New River will have foundations in bedrock to effectively neutralize the effect of scour on the foundations; further consideration will be given to avoid and/or minimize the effects of scour on downstream wetland habitat. Bridge pier footings to be placed in the New River could be constructed by using a barge as a platform, assuming an adequate depth of the river exists at the particular bridge pier location. Where possible, bridges will be constructed by using a crane on top of the structure to build the bridge section-by-section, from one bridge landing to the other. However, it is likely that some temporary fill will be placed in wetlands to construct piers.

Table 4.4.B presents bridge construction options and impacts to the New River and adjacent wetlands for Build Alternatives in the project study area. Impacts to the New River and adjacent wetlands could be reduced and/or eliminated by utilizing either the *through arch* or *cable-stayed bridge* option. For Alternatives 2A and 2B, neither the *through arch* or *cable-stayed bridge* option would require bridge pier footings in New River or adjacent wetlands.

TABLE 4.4.B BRIDGE CONSTRUCTION OPTIONS AND IMPACTS TO THE NEW RIVER AND/OR ADJACENT WETLANDS FOR BUILD ALTERNATIVES IN THE PROJECT STUDY AREA							
	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A'	Alt. 4B ¹	Alt. 4C ¹
Steel Girder Bridge							
Bridge piers in river/wetlands	3	4	3	5	8	9	8
Total area of bridge pier footings in river/wetlands	0.03 ha (0.07 ac)	0.04 ha (0.09 ac)	0.03 ha (0.07 ac)	0.05 ha (0.12 ac)	0.08 ha (0.19 ac)	0.09 ha (0.21 ac)	0.08 ha (0.19 ac)
Area of temporary causeway in river/wetlands	0.08 ha (0.19 ac)	0.03 ha (0.08 ac)	0.02 ha (0.06 ac)	0.10 ha (0.25 ac)	0.18 ha (0.44 ac)	0.13 ha (0.33 ac)	0.13 ha (0.31 ac)
Duration of construction in river	24 mo	24 mo	24 mo	24 mo	24 mo ⁻	24 mo ²	24 mo ²
Concrete Box Girder Bridge w/ Gantry Erection							
Bridge piers in river/wetlands	3	4	3	5	8	9	8
Total area of bridge pier footings in river/wetlands	0.03 ha (0.07 ac)	0.04 ha (0.09 ac)	0.03 ha (0.07 ac)	0.05 ha (0.12 ac)	0.08 ha (0.19 ac)	0.09 ha (0.21 ac)	0.08 ha (0.19 ac)
Area of temporary causeway in river/wetlands	0.08 ha (0.19 ac)	0.03 ha (0.08 ac)	0.02 ha (0.06 ac)	0.10 ha (0.25 ac)	0.18 ha (0.44 ac)	0.13 ha (0.33 ac)	0.13 ha (0.31 ac)
Duration of construction in river	18 mo	18 mo	18 mo	18 mo	18 mo ¹	18 mo ¹	18 mo ³
Through Arch Bridge							
Bridge piers in river/wetlands	0	0	2	2	2	2	4
Total area of bridge pier footings in river/wetlands	0	0	0.03 ha (0.06 ac)	0.04 ha (0.09 ac)	0.04 ha (0.09 ac)	0.04 ha (0.09 ac)	0.07 ha (0.15 ac)
Area of temporary causeway in river/wetlands	0.04 ha (0.10 ac)	0.01 ha (0.03 ac)	0.01 ha (0.03 ac)	0.10 ha (0.24 ac)	0.14 ha (0.34 ac)	0.11 ha (0.27 ac)	0.11 ha (0.27 ac)
Duration of construction in river	12 mo	18 mo	30 mo	24 mo	24 mo ⁴	24 mo ⁵	30 mo ⁶
Cable-Stayed Bridge							
Bridge piers in river/wetlands	0	0	2	0	0	0	2
Total area of bridge pier footings in river/wetlands	0	0	0.03 ha (0.06 ac)	0	0	0	0.03 ha (0.06 ac)
Area of temporary causeway in river/wetlands	0	0	0.03 ha (0.08 ac)	0	0	0	0.03 ha (0.08 ac)
Duration of construction in wetlands	0	0	30 mo	0	0	0	30 mo ⁷
¹ Alternatives 4A, 4B and 4C require bridge crossings of the New River in two different locations. ² Requires construction periods of 24 months for bridges in two different locations. ³ Requires construction periods of 18 months for bridges in two different locations. ⁴ Requires construction periods of 12 and 24 months for bridges in two different locations. ⁵ Requires construction periods of 18 and 24 months for bridges in two different locations. ⁶ Requires construction periods of 24 and 30 months for bridges in two different locations. ⁷ Requires construction periods of 0 and 30 months for bridges in two different locations. n/a denotes that a particular project alternative does not include the designated bridge.							

Source: WVDOT 1995a.

For Alternatives 3, 4A and 4B, the *cable-stayed bridge* option would not require bridge pier footings in New River or adjacent wetlands. For Alternatives 2A, 2B, 2C, 3, 4A, 4B and 4C, both the *through arch* and *cable-stayed bridge* options would require fewer bridge pier footings than the *steel girder* or *concrete box girder bridge* options.

Costs associated with the *through arch bridge* option would range from 58 to 63 percent higher than costs associated with either the *steel girder* or *concrete box girder bridge* options depending upon the alternative considered. Costs associated with the *cable-stayed bridge* option would range from approximately 2.2 to 4.4 times higher than costs associated with either the *steel girder* or *concrete box girder bridge* options depending upon the alternative considered.

A more detailed analysis of costs for bridge options is provided in Section 5.4 Traffic, Transportation and Noise. Figure 4.4.g depicts the four types of bridges considered for New River crossings in the project study area.

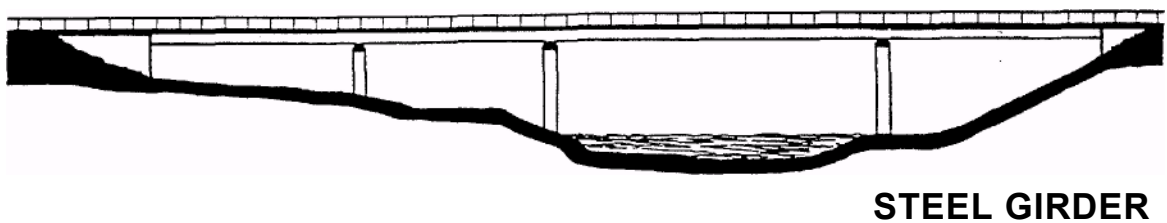
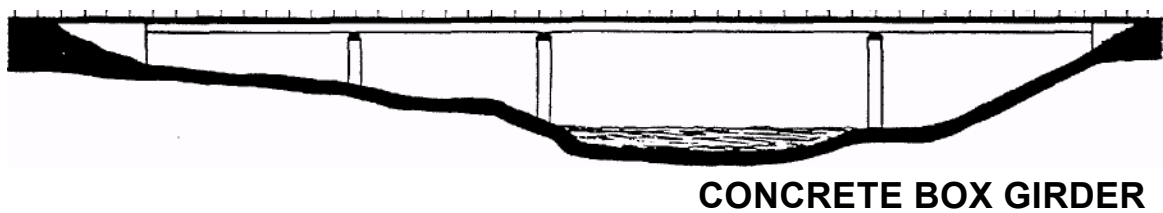
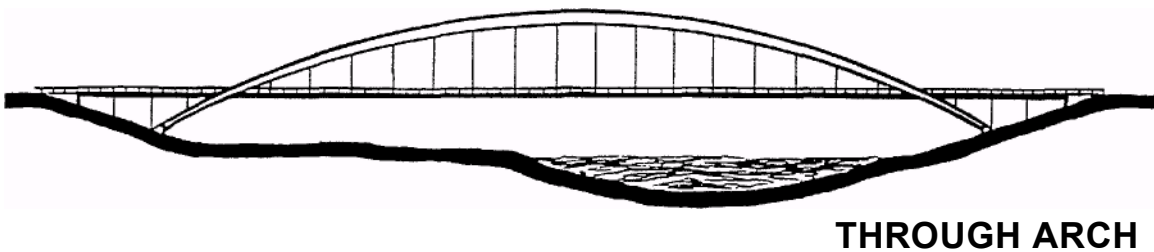
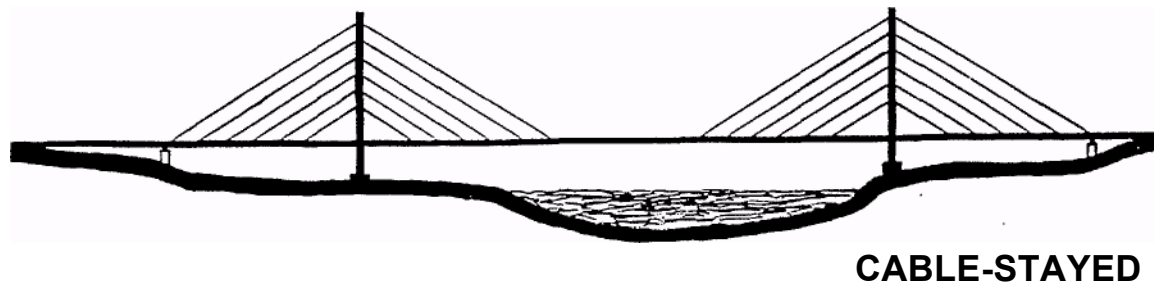
Wildlife nesting areas in wetlands that might be affected by project construction could possibly be safeguarded by limiting the time of construction to non-breeding/non-critical periods of the year. If limiting construction to certain times of the year is found to be necessary and practicable, avoidance strategies will be coordinated with the WVDNR and other agencies.

Roadway construction will follow all reasonable best management practices to ensure that impacts are minimized in accordance with federal and state sediment erosion control guidelines (FHWA 1978; USDA 1993). Temporary sedimentation impacts will be minimized through adherence to an approved erosion control plan and National Pollutant Discharge Elimination System (NPDES) General Permit Registration per DOH guidelines (WVDOT 1995c). Disturbed areas adjacent to wetlands will be regraded and revegetated to reduce the potential for erosion and sedimentation.

The flow of sediments and pollutants into wetlands will be controlled by maintaining an appropriately-sized, vegetated buffer between the parkway and adjacent wetlands, and by filtering stormwater runoff through vegetated swales, where possible. Sediment traps in catch basins will be considered to collect sediments in narrow portions of the parkway. Sediment traps would need to be periodically cleaned to remain effective. Infiltration beds beneath the road will also be considered. All reasonable efforts will be made to avoid the degradation of nearby wetlands where mechanized landclearing, ditching and channelization activities occur.

For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

Figure 4.4.g BRIDGE TYPES CONSIDERED FOR NEW RIVER CROSSINGS BY BUILD ALTERNATIVES IN THE PROJECT STUDY AREA



4.4.1.6 Coordination

Coordination and cooperation with the COE will continue throughout project development consistent with guidelines stipulated in Section 404(b)(1) of the Clean Water Act (CWA), 40 CFR Chapter 1, Guidelines For Specification Of Disposal Sites For Dredged Or Fill Material. Consistent with Section 404(b)(1), Subpart B - Compliance With the Guidelines, Paragraph 230.10, it is noted that no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. For the purpose of this requirement, practicable alternatives include: (1) activities which do not involve a discharge of dredged or fill material into the waters of the United States or ocean water; and (2) discharges of dredged or fill material at other less sensitive locations in waters of the United States or ocean waters.

Requirements of Section 404(b)(1) of the CWA require decisions to be made that include reduction and minimization of project effects on sensitive wetland and aquatic resources. Demonstration and selection of the least damaging practicable alternative will be required as part of the Section 404(b)(1) permitting process. Given the uniqueness and sensitivity of wetlands and Resource Category 1 habitat in the project study area, any discharge of dredge or fill into these areas is a concern. If a Build Alternative that impacts riverine wetlands is selected as the most practicable alternative, compensatory mitigation will be required to replace the area, cover type and functional value of impacted areas. Compensatory mitigation ratios will be applied as necessary.

Following the selection of a preferred alternative, the DOH will delineate and COE will verify all wetlands that may potentially be impacted, and final wetland impacts will be quantified. If no practicable alternative exists to filling wetlands, a Section 404 permit will be submitted (consistent with the aforementioned Guidelines) for COE and EPA review and approval before construction is initiated. The permitting authority shall determine in writing the potential short-term and long-term effects of a proposed discharge of dredged or fill material on the physical, chemical and biological components of the aquatic environment, including potential impacts on: (1) physical and chemical characteristics of the aquatic ecosystem (includes substrate, suspended particulates, turbidity, water quality, current patterns of water circulation and water fluctuation); (2) biological characteristics of the aquatic ecosystem (especially fish and other aquatic organisms, and other wildlife); (3) special aquatic sites (in particular, wetlands, vegetated shallows, and riffle and pool complexes); and (4) human use characteristics (such as water supply, recreation and fishing, and aesthetics and education). Findings of potential impacts on the physical, chemical and biological components of the aquatic ecosystem will be used by the COE and EPA to reach final determinations on project impacts and permitting status.

In addition to COE and EPA regulatory authority for the discharge of dredged and fill material into waters of the United States, including wetlands, WVDEP's Office of Water Resources (OWR) also has regulatory jurisdiction over the area below the OHW and would require a State 401 Certification if fill is to be placed in the New River below the OHW elevation.

All Section 404(b)(1) and State 401 Certification findings will be submitted to participating resource agencies for review prior to permit application.

Section 10.0 provides further information on COE federal permit requirements as stipulated by Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, and State 401 Certification.

4.5 SOILS

The project study area is dominated by the Calvin-Gilpin soils association except for the east side of the New River from south of Brooks Branch to just north of the community of Brooks which is within the Monongahela-Kanawha-Chagrin association (USDA 1975; USDA 1984).

The Calvin-Gilpin association is characterized by moderately deep, well drained, medium textured, mostly sloping to very steep soils on the dissected uplands and mountains. Calvin and Gilpin soils each comprise 40 percent of the association, while minor soils comprise the remaining 20 percent of the association. Calvin soils are moderately deep and well drained, but very steep and stony. Gilpin soils are also deep and well drained, although very steep and stony. Minor soils of this association are the Dekalb soils in uplands, the Ernest and Meckesville soils on footslopes, and the Ashton, Landes, Philo and Pope soils on floodplains (USDA 1975).

The less sloping, nonstony soils of the Calvin-Gilpin association are suited for farming, however, the hazard of erosion and the presence of steep slopes pose management concerns. The extensive areas of very stony, very steep soils are mostly wooded. Slopes, stoney soils and bedrock near the surface are limitations for some recreational and community uses (USDA 1975).

The Monongahela-Kanawha-Chagrin association in Summers County is characterized as having deep, nearly level to strongly sloping, moderately well drained and well drained, acid and lime-influenced soils; it is found on stream terraces, and high and low floodplains. The association is approximately 40 percent Monongahela soils, 20 percent Kanawha soils, 15 percent Chagrin soils and 25 percent various soils of minor extent. The Monongahela soils are moderately well drained; Kanawha and Chagrin soils are well drained. The minor soils in this association are the Tygart Variant soils on stream terraces, and the Lobdell and Orville soils and Udifluvents on floodplains (USDA 1984).

The Monongahela-Kanawha-Chagrin association has good potential for farming. A seasonal high water table and a hazard of flooding are the major limitations for community development. The association has very good to good potential for trees and excellent potential for the development of recreation areas and wildlife habitat (USDA 1984).

See Section 4.1.1 Rugged Terrain and Highly Erodible Soils for a discussion of highly erodible soils.

4.5.1 Agricultural Soils

Agricultural soils are considered because they are an important soil resource which could potentially be adversely impacted by project construction. Any adverse impacts to agricultural soils could severely limit their ability to support crop production.

Agricultural soils primarily include open pasture and cultivated areas in valleys and the lower shoulders of ridges and hillslopes. SCS Class I soils are those having slight limitations that restrict their use for agricultural purposes. Soils of classes II through VII have limitations for agricultural use based on their topographic position and slope or other restrictions, such as shallow depths, droughtiness, wetness or potential for erosion.

In accordance with the Farmland Protection Policy Act (FPPA) of 1984, potential project-related farmland involvements are assessed. Coordination with the USDA/SCS district office has been initiated to complete the required Farmland Conversion Impact Rating Form (Form AD-1006). Farmland ratings are provided for each Build Alternative.

The purpose of this evaluation is to ensure that potential involvements with agricultural lands are taken into consideration during the selection of a preferred alternative.

4.5.1.1 Methodology

The SCS Soil Surveys for Summers County (USDA 1984) and Raleigh County (USDA 1975) and the SCS land capability classification system were used in the identification of productive agricultural soils. Land use capability groupings show, in a general way, the suitability of soils for most kinds of field crops. The groupings are determined according to the limitations of the soils when used for field crops, the risk of damage when used for farming and the way they respond to treatment. Class I soils and Class II soils with the subclass designation "w" (Summers County) and "w-6" or "e-4" (Raleigh County) were identified as agricultural soils and mapped within the project study area. The SCS defines Class I soils as having slight limitations that restrict their use for most field crops. The SCS defines Class II w and w-6 soils as having wetness as the only limitation for their use in farming. Class II e-4 soils are limited for farming only by slope or the potential slope lends for erosion. Class II w, w-6 and e-4 soils, located above wetlands or in areas having gentle slopes, were mapped with Class I soils as agricultural soils.

In accordance with the FPPA, the criteria for determining prime, unique and statewide important agricultural lands are based on soil type and slope regardless of whether or not the land in question is used currently for agricultural purposes. Within each state, District Conservationists are responsible for determining which soils should be classified as being prime, unique or of statewide importance, and therefore, which should be afforded protection under the FPPA. In

general, the steep terrain of the project study area reduces the occurrence of soil types that are prime, unique or of statewide importance, as farmland must be within specified slope limits to meet such designations.

4.5.1.2 Affected Environments

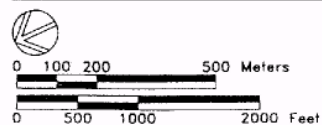
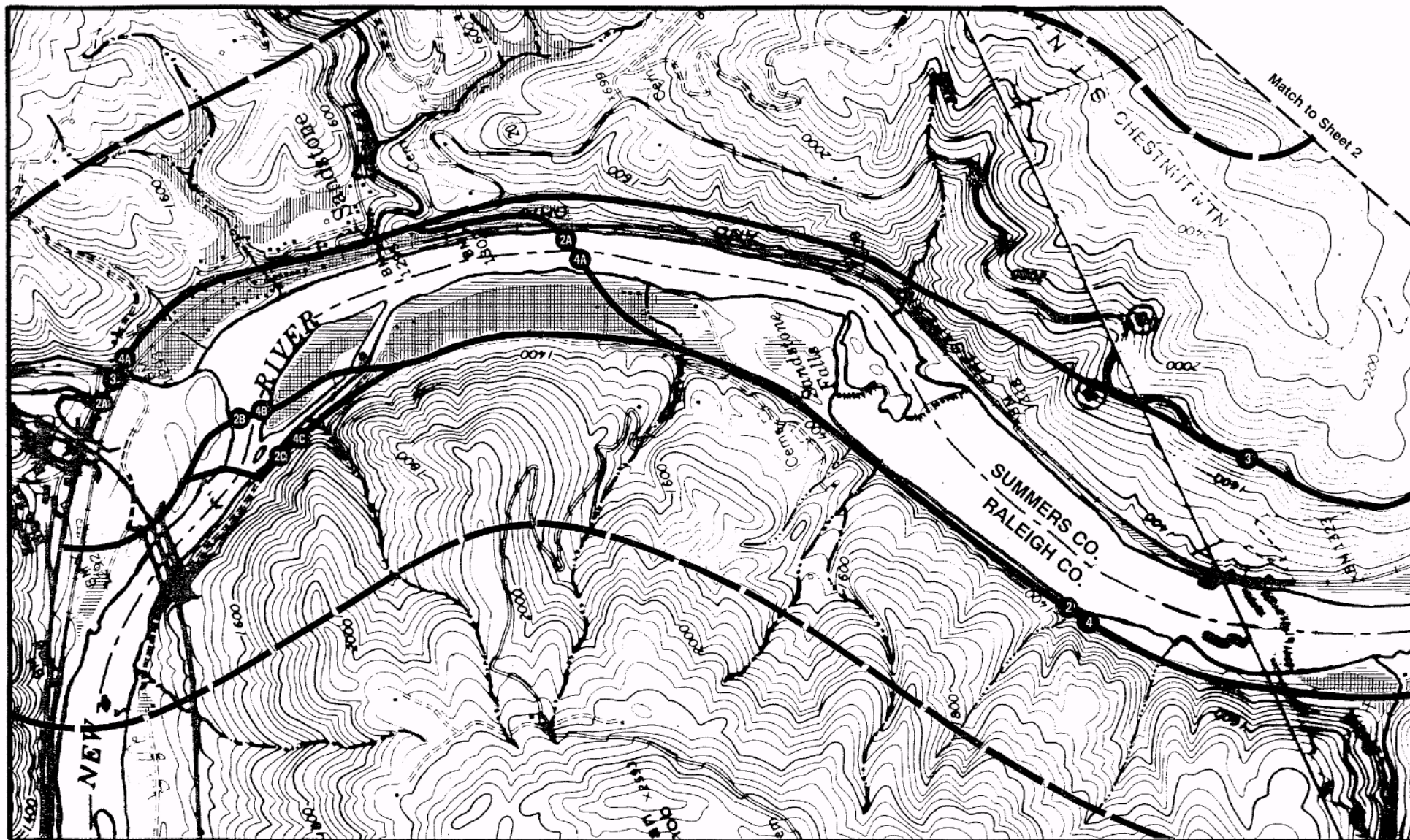
Within the project study area, Class I and Class II w and w-6 soils are limited to the bottomland terraces adjacent to the New River. Class II e-4 soils are found adjacent to the New River and along footslopes on the west side of the river. The predominance of steep terrain in the project study area has restricted the extent to which these soils occur. Figures 4.5.a, 4.5.b and 4.5.c depict areas of agricultural soils in the project study area. Prior to the construction of I-64, agricultural soils were found in a broad area north of Lick Creek (USDA 1984); however, unspecified fill material now lies at this location.

Farms in the project study area produce crops such as corn and hay, and to a lesser extent, livestock such as cattle and hogs. While farming in the project study area is culturally and historically significant, over time it has become less important economically. The Richmond Farm, at 24 hectares (60 acres), is the largest farm in the project study area, followed by the Terreo Farm which is approximately 12 hectares (30 acres) in size.

4.5.1.3 Potential Direct Impacts

Primary concerns are the potential displacement and the permanent loss of agricultural soils and lands currently used for agricultural purposes. Table 4.5.A presents potential impacts on agricultural soils for Build Alternatives in the project study area. The No-Build Alternative is not included in Table 4.5.A as this project alternative will have no direct impact on agricultural soils.

TABLE 4.5.A DIRECT IMPACTS TO AGRICULTURAL SOILS FOR BUILD ALTERNATIVES IN THE PROJECT STUDY AREA							
	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
Agricultural Soils Impacted	12 ha ¹ (29 ac)	11 ha ¹ (28 ac)	11 ha ¹ (28 ac)	5 ha ¹ (13 ac)	10 ha (24 ac)	10 ha (24 ac)	10 ha (24 ac)
Agricultural Soils Impacted/ Total Agricultural Soils	6.7% ¹	6.5% ¹	6.5% ¹	3% ¹	5.6%	5.6%	5.6%
¹ Option 2D/3A impacts 0.3 ha (0.6 ac) more agricultural soils compared to Alternatives 2 and 3; this higher impact is equivalent to a 0.1 percent increase in agricultural soils impacted/total agricultural soils compared to Alternatives 2 and 3. Total Agricultural Soils in Project Study Area = 174 ha (431 ac).							

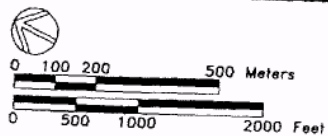
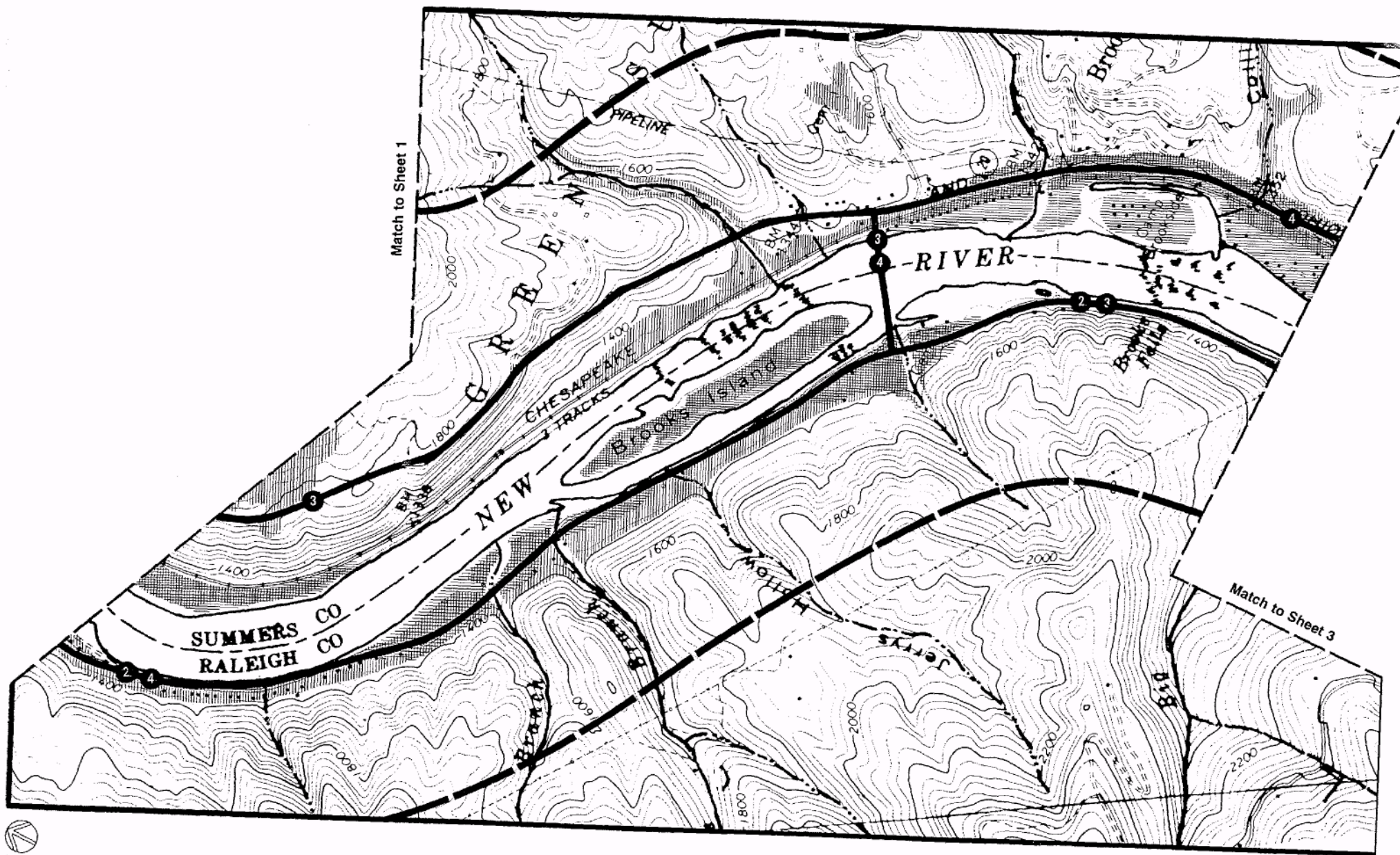


 MODERATE SUITABILITY FOR SEPTIC

 AGRICULTURAL SOILS

SOILS **New River Parkway** **West Virginia**

Northern Section
 Sheet 1 Fig. 4.5

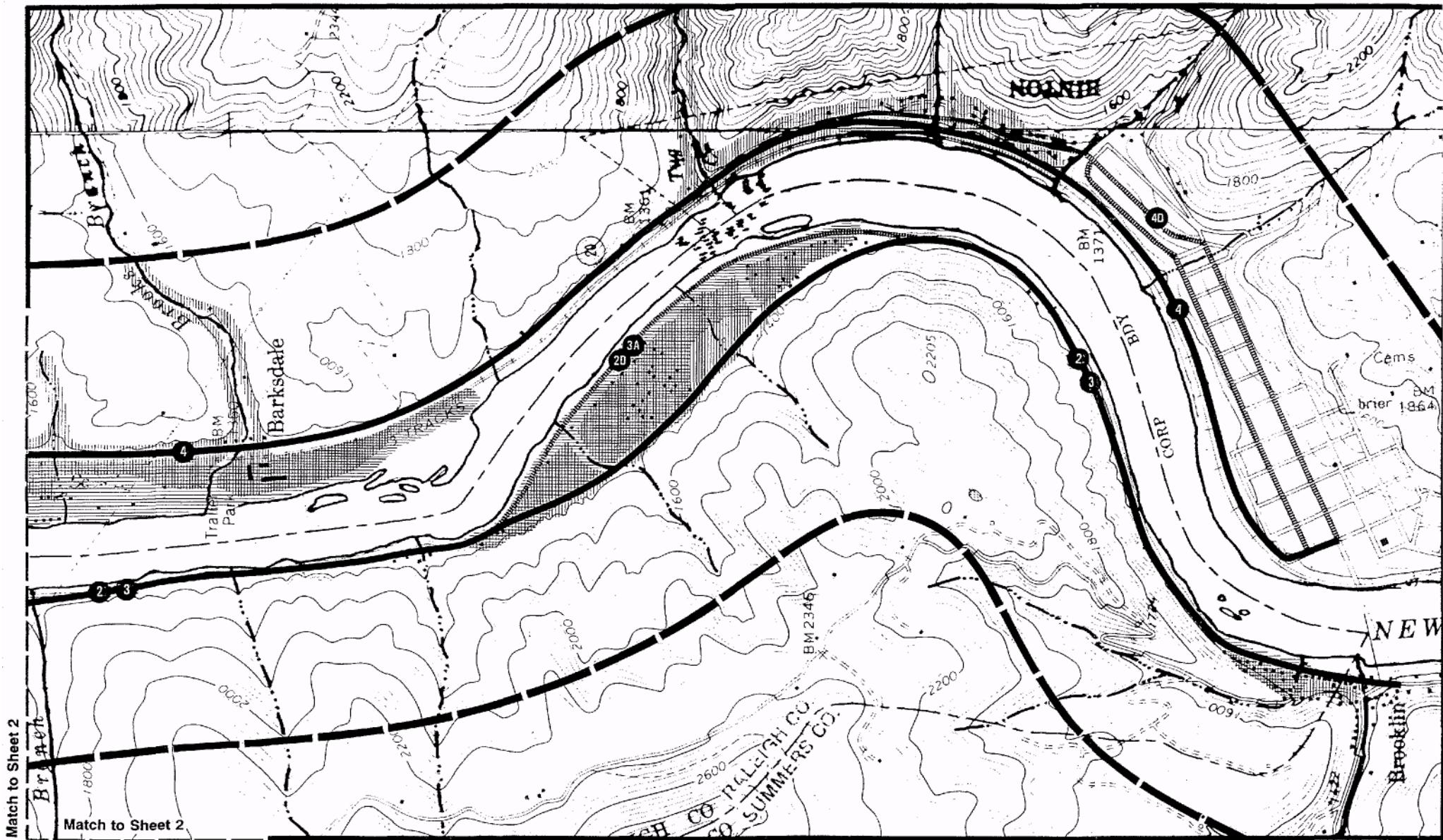


 MODERATE SUITABILITY FOR SEPTIC

 AGRICULTURAL SOILS

SOILS
New River Parkway
West Virginia

Northern Section
 Sheet 2 Fig. 4.5.1



0 100 200 500 Meters
0 500 1000 2000 Feet



MODERATE SUITABILITY FOR SEPTIC



AGRICULTURAL SOILS

SOILS
New River Parkway
West Virginia

Northern Section
Sheet 3 Fig. 4.5.c

Alternative 2A and Alternatives 2B and 2C impact the greatest amount of agricultural soils [12 and 11 hectares (29 and 28 acres), respectively], while Alternative 3 impacts the least amount of agricultural soils [five hectares (13 acres)]. Option 2D/3A impacts 0.3 hectares (0.6 acres) more agricultural soils than Alternatives 2 and 3 which is equivalent to a 0.1 percent increase in agricultural soils impacted/total agricultural soils compared to Alternatives 2 and 3. Including Option 2D/3A, none of the Build Alternatives impacts more than 6.8 percent of the total agricultural soils identified in the project study area.

A discussion of potential direct impacts to prime, unique and statewide important lands is provided in conjunction with the SCS Farmland Conversion Impact Rating Form summarized in Table 4.5.B. The No-Build Alternative is not included in Table 4.5.B as this project alternative will have no impact on FPPA farmland. Refer to Appendix I: SCS Farmland Conversion Impact Rating Form for a reprint of Form AD-1006.

TABLE 4.5.B FARMLAND CONVERSION IMPACT RATING FOR BUILD ALTERNATIVES IN THE PROJECT STUDY AREA					
	Alt. 2A	Alt. 2B/2C	Alt. 3	Alt. 4A	Alt. 4B/4C
Total Area of Prime and Unique Farmland	RC 7 ha (18ac) SC 0.4 ha (1ac)	RC 8 ha (19ac) SC 1 ha (3 ac)	RC 2 ha (5 ac) SC 0 ha (0 ac)	RC 6 ha (15ac) SC 3 ha (Sac)	RC 6 ha(15ac) SC 4 ha (11 ac)
Total Area of Statewide and Local Important Farmland	RC 6 ha(15ac) SC 2 ha (6 ac)	RC 6 ha (16ac) SC 2 ha (4 ac)	RC 1 ha (3 ac) SC 8 ha (19ac)	RC 5 ha (12ac) SC 4 ha (9 ac)	RC 5 ha (13ac) SC 3 ha (7 ac)
Percent of Farmland in Counties to be Converted	RC 0.001 SC 0.001	RC 0.001 SC 0.001	RC 0.001 SC 0.001	RC 0.001 SC 0.001	RC 0.001 SC 0.001
Percent of Farmland in Counties with Same or Higher Relative Value	RC 100 SC 100	RC34 SC28	RC 100 SC 100	RC34 SC100	RC34 SC100
Relative Value of Farmland to be Converted (out of 100)	RC 31.6 SC 25.7	RC 46.5 SC 62.0	RC 14.8 SC 19.3	RC 50.5 SC 22.0	RC 47.2 SC 27.6
Total Site Assessment Points (out of 160)	RC58 SC25	RC75 SC35	RC40 SC34	RC52 SC21	RC70 SC21
Total Points (out of 260)	RC 89.6 SC 50.7	RC 121.5 SC 97.0	RC 54.8 SC 53.3	RC 102.5 SC 43.0	RC 117.2 SC 48.6
RC = Raleigh County; SC = Summers County. Total farmable land in the two counties and as defined in FPPA: Raleigh County 34,573 ha (85,430 ac); Summers County 34,136 ha (84,350 ac).					

Much of the farmland in the project study area has been and continues to be converted to single family residential and seasonal dwelling/camping land uses. Table 4.5.B indicates that some project alternatives will require conversion of farmland considered to be prime, unique, or of statewide or local importance. Evaluations were performed on project alternatives following

criteria established by 7 CFR Part 658 of the FPPA, Federal Register, Volume 49, Number 130, July 5, 1984, Rules and Regulations, 7 CFR 658.4 (FHWA 1984):

- (1) Sites with the highest combined scores will be regarded as most suitable for protection under these criteria and sites with the lowest scores as least suitable.
- (2) Sites receiving a total score of less than 160 will be given a minimal level of consideration for protection and no additional sites will be evaluated.
- (3) Sites receiving scores totalling 160 or more will be given increasingly higher levels of consideration for protection.

As Table 4.5.B indicates, none of the Build Alternatives will exceed the combined 160 point threshold for a minimal level of consideration for protection as established by the FPPA. Alternatives 2B/2C and 4B/4C will have the highest impact on FPPA farmland in Raleigh County (combined scores of 121.5 and 117.2, respectively). Alternative 2B/2C will have the highest impact on FPPA farmland in Summers County (combined score of 97.0). With the exception of the No-Build Alternative, Alternative 3 will have the least impact on FPPA farmland in Raleigh County (combined score of 54.8) and Alternative 4A will have the least impact on FPPA farmland in Summers County (combined score of 43.0).

4.5.1.4 Potential Secondary and Cumulative Impacts

Secondary impacts include the loss of visual or aesthetic qualities associated with productive agricultural soils, and the potential for water quality degradation if existing farmland is lost to development or if there are increased pressures for agricultural production on the remaining Class I and II soils in the project study area.

Development on Class I and II soils is currently occurring north of the I-64 bridge outside of the project study area and along Route 26 to a limited degree. The incremental loss of farmable land would possibly be quickened with implementation of the project, even with an LMS in place because property owners will ultimately decide whether they will convert their land to non-farmland uses or sell their land to interested developers.

Cumulative impacts to agricultural soils on the west side of the New River are anticipated if Route 26 is improved in the future.

4.5.1.5 Potential Mitigations

Avoidance of agricultural soils through alignment alteration is the primary mitigation measure that will be used. Because FPPA ratings are well below 160, avoidance is not necessary for FPPA farmland. However, exceptions to design criteria will be considered in order to tighten

curves and reduce road widths, thus avoiding or minimizing the impacts to farms of local importance. Roadway design exceptions for farm areas will be considered during final design.

Direct and secondary impacts can be mitigated by implementing appropriate erosion control measures and by protecting the features which are integral to the visual integrity of agricultural landscapes. The LMS will direct that property owners and developers use appropriate erosion control measures and retain important agricultural viewsheds within the parkway corridor.

For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.5.2 Soils Suitable for Septic Absorption Fields

In project planning and construction, a major concern involves the loss of soils that could be used for septic absorption fields. This is particularly important to developing rural communities where public sanitary sewer service is not immediately available. The loss of soil resources which can be used for on-site septic purposes can impair community development efforts and/or lead to the degradation of surface and groundwater quality due to ineffective wastewater treatment. This is especially important in the project study area because there is currently a shortage of areas with appropriate soils for septic absorption field construction.

4.5.2.1 Methodology

The soil surveys of Raleigh County (USDA 1975) and Summers County (USD A 1984) were used to identify each soil type's suitability for septic absorption fields and their location within the project study area. The SCS rates each soil as to the degree and kind of soil limitation that affects septic tank absorption fields. The limitations are considered: *slight* if soil properties or site features are generally favorable for use as an absorption field, and if limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for use as an absorption field, and if special planning, design or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs and increased maintenance are required (USDA 1984).

4.5.2.2 Affected Environments

Figures 4.5.a, 4.5.b and 4.5.c depict the locations of soils within the project study area that the SCS identifies as having moderate suitability for septic absorption field use. Soil areas that are listed as severe and are limited only by flooding or steep slopes are identified as having moderate suitability for septic, if, and only if, these soil types are outside of the 100-year flood area or are on land having slopes less than 20 percent. In general, soil types more suited for septic systems

are composed primarily of silt loams, fine sandy loams and silty clay loams of good depth [greater than 1.2 meters (4 feet) deep].

There are no soils within the project study area that have only slight limitations for septic field use. There are areas along both sides of the New River that are classified as having moderate suitability for septic systems. All other soil areas have been designated severe, and thus are unsuitable for septic absorption fields.

4.5.2.3 Potential Direct Impacts

An analysis of the direct involvement of alternatives with soils moderately suited for septic systems shows minimal impacts. This is due, in part, to the routing of alternative alignments primarily along existing roadways within the project study area. However, because of the limited area where individual septic systems can be appropriately placed, the construction of the project may eliminate the use of some existing septic systems.

4.5.2.4 Potential Secondary and Cumulative Impacts

In the future there will be fewer areas with suitable soils for septic systems given the increase in development that is anticipated along the parkway.

4.5.2.5 Potential Mitigations

In addressing direct impacts, properties having septic systems that are impacted by the project will have septic systems replaced, provided there is sufficient room to construct a septic system on the property. If the properties impacted by the project lack the necessary area for construction of a new septic system, then the property would be purchased at fair market value unless proper sewage treatment facilities otherwise become available.

Secondary and cumulative impacts can be minimized through the construction of new sewage treatment systems in areas of need. The provision of sewage treatment facilities with enough capacity to handle future growth and development, and the provision of sanitary sewer connections in potential growth and development areas will be the most effective strategies to account for the potential loss of soils suitable for septic systems. The LMS will encourage partnerships that make such facilities possible and limit the density of developments where treatment facilities are not present.

For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.6 TERRESTRIAL AND AQUATIC HABITAT

Braun (1950) identifies the New River and its tributaries as part of the mixed mesophytic forest region of central Appalachia. The NPS General Management Plan (USDOI 1982) states that:

"... the position of New River in this formation together with the marked topographic diversity of the gorge ... have led to the development of an unusually varied flora, including species with northern or southern affinities and disjunct populations of plants from other regions."

The New River gorge serves as a distributional corridor for plants between the eastern coastal plains and the Mississippi Valley, and contains plants common to either or both of those regions but uncommon elsewhere in the central Appalachians (USDOI 1982).

Vegetation in the project study area provides cover for nesting and protection, and serves as a food source to many animals. Forests in the area offer productive wildlife habitat, with birds being the most visible and attractive animals witnessed by visitors, while the New River and its tributaries comprise one of the most important warmwater fisheries in West Virginia (USDOI 1982).

Table 4.6.A summarizes existing terrestrial and aquatic habitat characteristics for the project study area.

TABLE 4.6.A EXISTING TERRESTRIAL AND AQUATIC HABITAT IN THE PROJECT STUDY AREA		
Habitat Types	Approximate Coverage	Percentage of all Habitat in the Study Area
Terrestrial Habitat: Upland	1,963 ha (4,850 ac)	64%
Terrestrial Habitat: Riparian	198 ha (490 ac)	6%
Terrestrial Habitat: Disturbed	500 ha (1,236ac)	16%
Aquatic Habitat: New River	417 ha (1,030 ac)	14%
Total Terrestrial and Aquatic Habitat	3,078 ha (7,606 ac)	100%

4.6.1 Terrestrial Habitat

The project study area provides habitat for over 40 species of mammals common to the Appalachian Mountains (Grafton and Grafton 1980). Medium and large mammals that are found in the project study area include opossum, raccoon, striped skunk, weasel, bobcat, red fox, woodchuck, cottontail rabbit, three tree squirrel species, southern flying squirrel and white-tail deer (Grafton and Grafton 1980). Black bear appear to be increasing in number in isolated areas of the deep forests of the gorge (USDOI 1982). Small mammals identified during a 1984-1985 study in the NRGNR include three species of mice, three species of voles, four species of shrews, two species of moles, eastern woodrat, eastern chipmunk and eastern pipistrel bat (Buhlmann and Vaughan 1987). During the study, 15 species of salamanders, nine species of frogs and toads, 10 species of snakes, two species of lizards and six species of turtles were also identified. Additional terrestrial animal species in the NRGNR have been identified by Pauley (1993).

Over 80 species of birds are known to inhabit the area. Wild turkey and ruffed grouse are game birds commonly found in the forests. Wood ducks rely on forested habitat for nesting cavities and food, especially in riparian zones. Catbird, belted kingfisher, swift and warblers are frequently sighted in riparian habitat. Blackbirds, crow, geese, wild turkey, dove and other more common birds are found in abundance in open lands (Buhlmann and Vaughan 1987). Quail, though uncommon in the region, may potentially be found in open, agricultural lands (C. Taylor, Wildlife Biologist, WVDNR, personal communication, September 1995).

A major concern related to terrestrial habitat impacted by project construction is right-of-way clearing and the resultant loss of habitat. The clearing of trees and introduction of roads opens the forest canopy and adversely affects wildlife associated with more mature forest habitat while providing an increase in the amount of transitional zones commonly inhabited by smaller mammals and bird species.

4.6.1.1 Methodology

The methodology used to evaluate potential impacts to terrestrial habitat began with mapping habitat types as identified and adapted from a study conducted by the Virginia Cooperative Fish and Wildlife Research Unit and the Virginia Tech Department of Fisheries and Wildlife Sciences (Buhlmann and Vaughan 1987). Figures 4.6.a, 4.6.b and 4.6.c depict woodland habitat types in the project study area. These habitat types serve as "indicators" to the possible presence of various wildlife species (see Appendix J: Fauna Associated With Terrestrial and Aquatic Habitat In The New River Gorge for a list of fauna associated with terrestrial and aquatic habitat). The extent and type of habitat affected by project construction was determined by using an overlay method and is expressed in terms of the approximate percentage of habitat fronting each project alternative.

To assess the relative levels of direct impact for each project alternative, 12 terrestrial habitats identified by Buhlmann and Vaughan (1987) were grouped into three general terrestrial habitat types: upland, riparian and disturbed. Construction limits for each project alternative, depicted on 1:2,400 scale preliminary engineering drawings, were analyzed in conjunction with 1:12,000 scale woodland habitat maps in an effort to determine the impacts on the three types of general terrestrial habitat.

4.6.1.2 Affected Environment

Descriptions of terrestrial habitat that occur within the project study area are based on a study conducted by Buhlmann and Vaughan (1987). These descriptions also serve as the key to Figures 4.6.a, 4.6.b and 4.6.c.

Upland Habitat:

- (UPH) Upland hardwood habitats cover the sides of the gorge from the border with floodplain forests to the ridgetops. Species composition is primarily red oak, tulip poplar, black cherry, maples and hickories. Species composition varies with elevation and aspect.

Riparian Habitat:

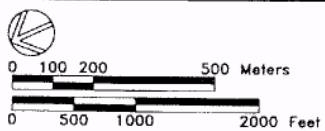
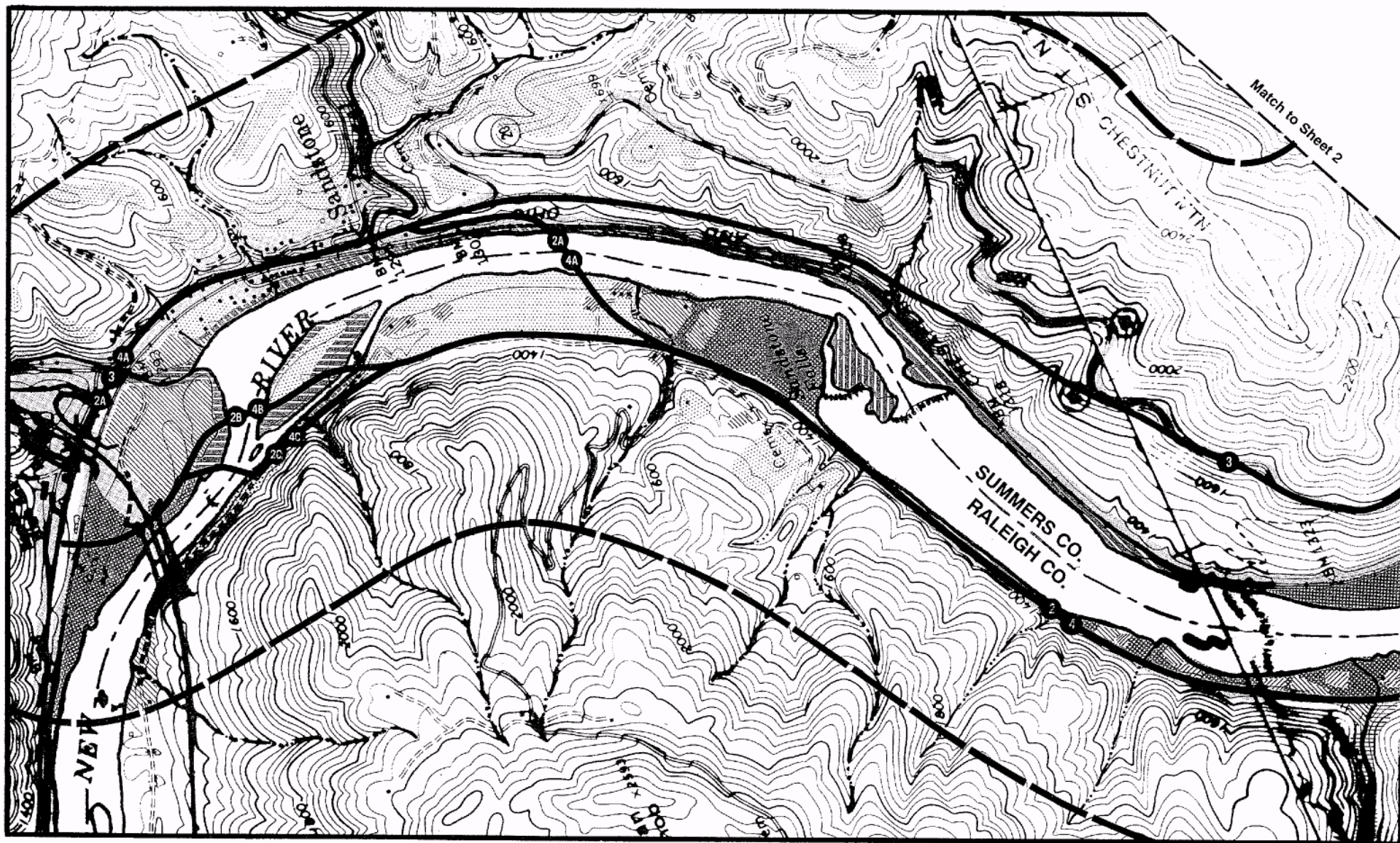
- (SSW) Stunted sycamore/willow habitats consist of sycamore, black willow and river birch saplings which have been heavily damaged by flooding. The understory is predominantly cobble and boulder. This habitat occupies the lowest terrace and is the most frequently flooded habitat.
- (SWB) Sycamore/willow/birch/silver maple habitats are the dominant riparian habitat in the southern two-thirds of the New River gorge. These habitats are composed primarily of sycamore, black willow, river birch, silver maple and honey locust. Typically, these are dense stands of small diameter trees [less than 20 cm (8 inches)] occurring on sites where sediments are deposited, such as floodplains and islands.
- (SYC) Mature sycamore habitats are similar to SWB habitats, but are composed primarily of large sycamores. This habitat is probably not as common as it once was due to human occupancy along the river, removal of large trees and human pressures associated with river bank camping.
- (RVP) Riparian Virginia pine forms an unusual riparian habitat with the overstory dominated by Virginia pine. The understory is composed of shrubs and grasses, with cobble and sandy soil. It is found at three sites in the project study area: north of Tug Creek Falls and near Sandstone Falls on the west side of the river, and near Camp Brookside on the east side of the river.
- (HRR) Hemlock rip-rap habitats occur along the river where upland slopes greater than 30 percent meet the river. They are principally composed of hemlock, oaks, Ohio buckeye and other upland hardwoods. A good example of this habitat type is at the base of the cliffs near the I-64 bridge on the west side of the river in the project study area.
- (RRR) Rock rip-rap habitats, similar to HRR habitats, are found on slopes greater than 30 percent and consist of upland hardwood species. Large rocks account for most of the understory.

- **(TSG)** Tributary stream gorge habitats are found bordering most tributary streams in the gorge and are composed of hemlock, yellow birch, red maple and buckeye. The understories commonly include rhododendron and ferns, and are usually cool and moist areas.

Disturbed Habitat:

- **(FAR)** Farmland habitats are found on high floodplains and nonflooded terraces in the southern area of the New River gorge. These habitats consist of open fields or meadows, grazing areas for livestock or areas planted in com. Exotic tree species often invade these habitats.
- **(OLD)** Old field habitats are located on nonflooded terraces (since completion of the Bluestone Dam), primarily in the southern area of the New River gorge. They are usually abandoned homesteads or farming sites and are comprised of heavy underbrush, thorns and forbs.
- **(DEV)** Developed habitats refer to areas along the river where the natural riparian vegetation has been replaced by homes, trailers and/or industry.
- **(DIS)** Disturbed habitats include roadways, strip mines, clearcuts and other areas where the natural upland vegetation has been disturbed and/or altered by construction activities.

Table 4.6.B presents information concerning specific habitat types fronting project alternatives while Table 4.6.C presents information concerning general habitat types fronting project alternatives. From these tables, it can be seen that Alternative 2 passes through a fairly even mix of upland, riparian and disturbed habitat along the west side of the river. Alternatives 3 and 4 pass through predominantly upland and disturbed habitat and, to a lesser extent, riparian habitat as these alternatives move along both sides of the river from east to west and west to east, respectively.



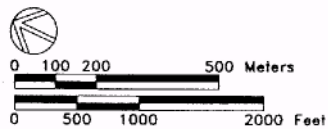
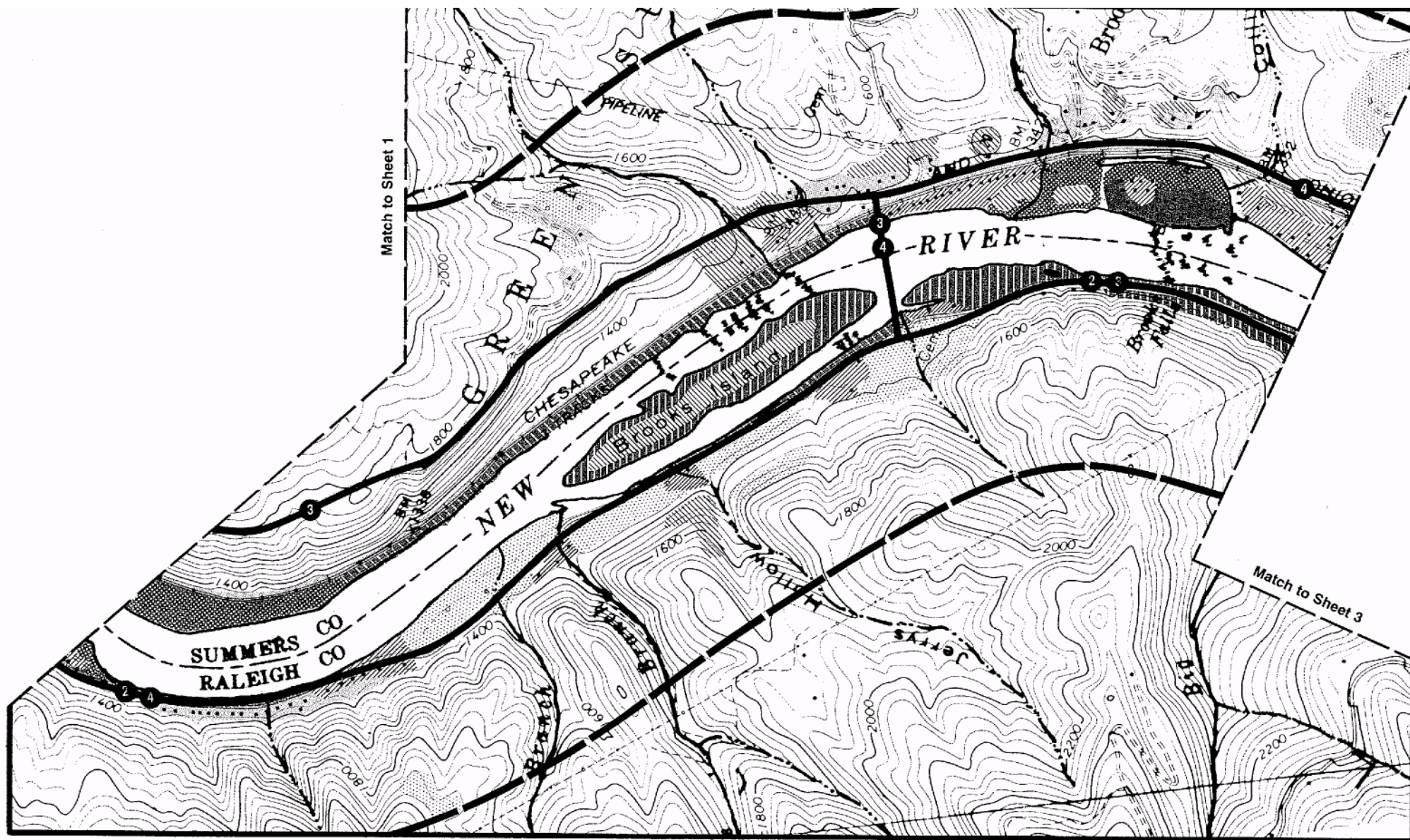
HABITAT TYPES:

	RVF		SWB		RRR		FAR		DEV		HRR
	SYC		SSW		TSG		DIS		OLD		UPH

HABITATS

New River Parkway
West Virginia

Northern Section
Sheet 1 Fig. 4.6.a



HABITAT TYPES:

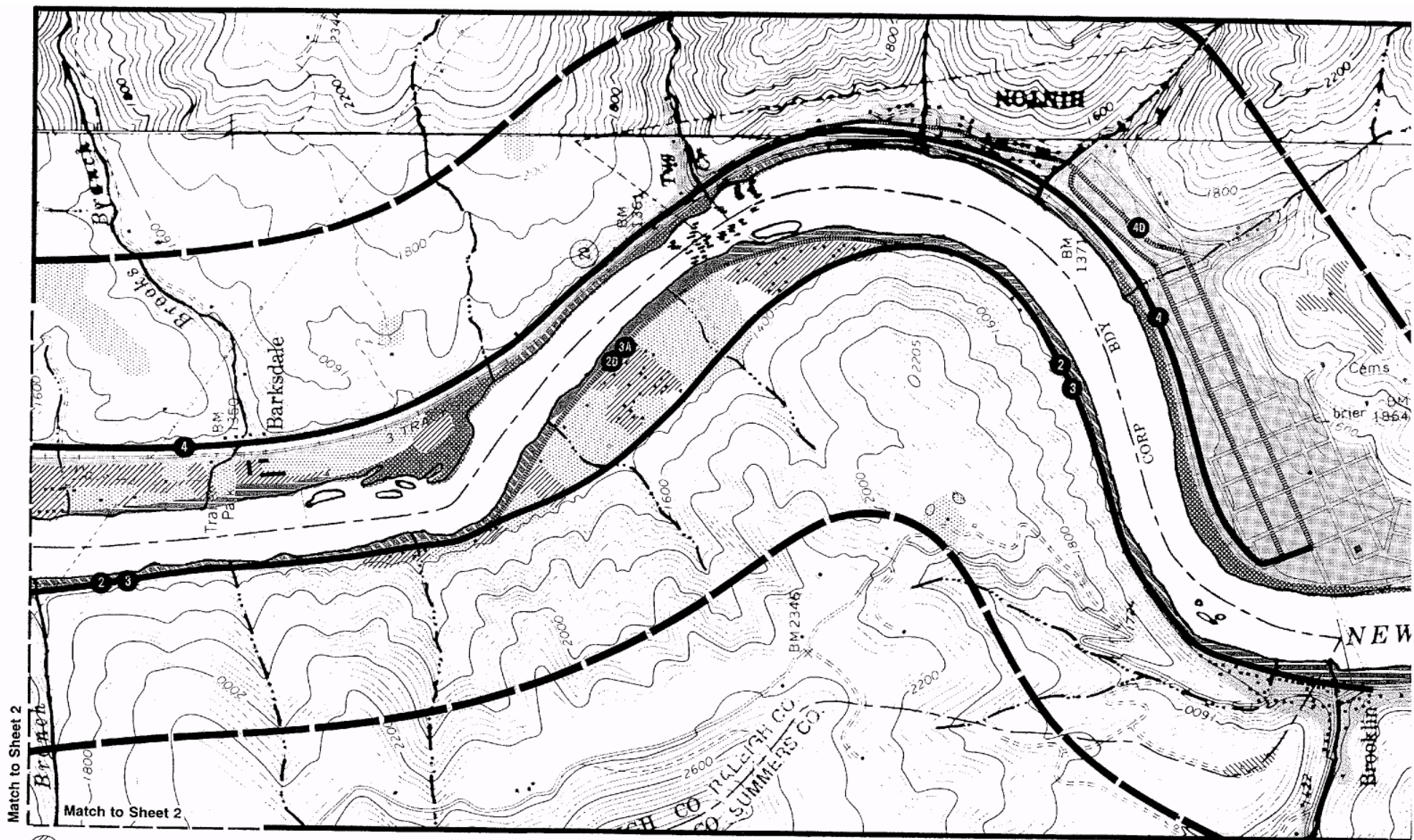


HABITATS

New River Parkway
West Virginia

Northern Section

Sheet 2 Fig. 4.6.t



0 100 200 500 Meters

0 500 1000 2000 Feet

HABITAT TYPES:



RVP



SWB



RRR



FAR



DEV



HRR



SYC



SSW



TSG



DIS



OLD



UPH

HABITATS

New River Parkway
West Virginia

Northern Section

Sheet 3 Fig. 4.6.c

TABLE 4.6.B PERCENTAGE OF SPECIFIC HABITAT TYPES FRONTING PROJECT ALTERNATIVES							
Habitat Type	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
UPH	25.2%	25.5%	26.6%	43.7%	42.1%	42.3%	42.7%
SSW	4.6%	6.1%	5.1%	4.8%	-	1.4%	0.4%
SWB	8.0%	8.3%	8.3%	-	8.2%	8.4%	8.4%
SYC	6.5%	6.5%	6.5%	7.3%	0.4%	0.4%	0.4%
RVP	-	-	-	-	-	-	-
HRR	-	-	1.5%	-	-	-	1.6%
RRR	15.3%	15.8%	16.3%	9.8%	6.2%	6.3%	6.9%
TSG	0.6%	0.3%	0.3%	0.3%	0.6%	0.3%	0.3%
FAR	17.7%	18.5%	17.0%	9.3%	9.7%	10.0%	8.9%
OLD	1.0%	3.6%	3.0%	1.1%	1.2%	3.8%	3.3%
DEV	9.9%	10.3%	10.3%	5.4%	7.3%	7.5%	7.5%
DIS	10.4%	5.1%	5.1%	16.4%	21.2%	16.0%	16.0%
UFH*	0.8%	0.0%	0.0%	1.9%	3.1%	3.6%	3.6%
UFH* = Unaccounted For Habitat.							

TABLE 4.6.C PERCENTAGE OF GENERAL HABITAT TYPES FRONTING PROJECT ALTERNATIVES							
	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
Upland Habitat (UPH)	25.2%	25.5%	26.6%	43.7%	42.1%	42.3%	42.7%
Riparian Habitat (SSW, SWB, SYC, RVP, HRR, RRR, TSG)	35.0%	37.0%	38.0%	22.2%	15.4%	16.8%	18.0%
Disturbed Habitat (FAR, OLD, DEV, DIS)	39.0%	37.5%	35.4%	32.2%	39.4%	37.3%	35.7%
Unaccounted for Habitat (UFH)	0.8%	0%	0%	1.9%	3.1%	3.6%	3.6%

4.6.1.3 Potential Direct Impacts

Potential impacts to terrestrial habitat include disturbance and direct habitat destruction resulting from project construction. As shown in Table 4.6.D, Alternatives 2A and 4A impact the least amount of total terrestrial habitat [34 hectares (84 acres) and 33 hectares (82 acres), respectively]. Alternative 3 impacts the greatest amount of terrestrial habitat [40 hectares (98 acres)]. Alternatives 2B, 2C, 4B and 4C impact intermediate amounts of terrestrial habitat. The No-Build Alternative is not included in Table 4.6.D as this alternative will have no new impacts to terrestrial habitat.

TABLE 4.6.D DIRECT IMPACTS TO GENERAL TERRESTRIAL HABITAT TYPES BY BUILD ALTERNATIVES IN THE PROJECT STUDY AREA							
Habitat Types	Alt. 2A	Alt. 2B	Alt. 2C	Alt. 3	Alt. 4A	Alt. 4B	Alt. 4C
Upland Habitat Impacted (% of total upland habitat in project study area)	9 ha ¹ (22 ac) (0.5%)	8 ha ¹ (19 ac) (0.4%)	8 ha ¹ (20 ac) (0.4%)	19 ha ¹ (48 ac) (1%)	13 ha ² (32 ac) (0.7%)	12 ha ² (30 ac) (0.6%)	12 ha ² (30 ac) (0.6%)
Riparian Habitat Impacted (% of total riparian habitat in project study area)	7 ha ¹ (17 ac) (3.5%)	7 ha ¹ (18 ac) (3.7%)	8 ha ¹ (19 ac) (3.9%)	4 ha ¹ (9 ac) (1.8%)	3 ha ² (8 ac) (1.6%)	4 ha ² (9 ac) (1.8%)	4 ha ² (10 ac) (2.0%)
Disturbed Habitat Impacted (% of total disturbed habitat in project study area)	18 ha ¹ (45 ac) (3.6%)	23 ha ¹ (56 ac) (4.5%)	22 ha ¹ (54 ac) (4.4%)	17 ha ¹ (41 ac) (3.3%)	17 ha ² (42 ac) (3.4%)	21 ha ² (53 ac) (4.3%)	21 ha ² (51 ac) (4.1%)
Total Terrestrial Habitat Impacted (% of total terrestrial habitat in project study area)	34 ha ¹ (84 ac) (1.3%)	38 ha ¹ (93 ac) (1.4%)	38 ha ¹ (93 ac) (1.4%)	40 ha ¹ (98 ac) (1.5%)	33 ha ² (82 ac) (1.2%)	37 ha ² (92 ac) (1.4%)	37 ha ² (91 ac) (1.4%)
¹ Option 2D/3A impacts 1 ha (2 ac) less upland habitat, 4 ha (9 ac) less disturbed habitat, 1 ha (2 ac) more riparian habitat and 4 ha (9 ac) less total terrestrial habitat compared to Alternatives 2 and 3. In comparison to total habitat, Option 2D/3A impacts 0.03% less total upland habitat, 0.7% less total disturbed habitat, 0.4% more riparian habitat and 0.1% less total terrestrial habitat compared to Alternatives 2 and 3. ² Option 4D impacts 2 ha (5 ac) less upland habitat, 3 ha (8 ac) less disturbed habitat and 5 ha (13 ac) less total terrestrial habitat compared to Alternative 4. In comparison to total habitat, Option 4D impacts 0.1% less total upland habitat, 0.6% less total disturbed habitat and 0.2% less total terrestrial habitat compared to Alternative 4. There is no change in riparian habitat impacts with Option 4D.							

Alternatives 2 A, 2B and 2C impact comparatively large areas of riparian habitat, but comparatively small areas of upland habitat. Alternatives 2B and 2C impact the greatest amount

of disturbed habitat [23 and 22 hectares (56 and 54 acres), respectively], closely followed by Alternatives 4B and 4C [11 and 10 hectares (53 and 51 acres), respectively].

For all Build Alternatives, direct terrestrial habitat impacts compared to total terrestrial habitat in the project study area (see Table 4.6.A in Section 4.6 for total area of habitat) yield the following:

- Alternative 2C impacts the greatest amount of riparian habitat compared to total riparian habitat in the project study area, 3.9 percent;
- Alternative 2B impacts the greatest amount of disturbed habitat compared to total disturbed habitat in the project study area, 4.5 percent; and
- Alternative 3 directly impacts the greatest amount of terrestrial habitat compared to total terrestrial habitat in the project study area, 1.5 percent.

Alternatives 3, 4A, 4B and 4C impact the least amount of riparian habitat of all the Build Alternatives.

As previously discussed, the No-Build Alternative has no new impact to terrestrial habitat. Many impacts from Build Alternatives will be minimized because only a very narrow strip of land [sometimes only 1.5 to 3 meters (5 to 10 feet) in width on one or both sides of the proposed roadway] will be taken as a result of utilization of a narrow parkway cross section, retaining walls, and/or curb and gutter.

Build Alternatives will interfere with animal movement patterns in the project study area. For large mammals, this may result in individual deaths due to collisions with vehicles. For small mammals, reptiles and amphibians, the project alternatives may create a barrier that reduces or eliminates movement between populations. By using bridges and culverts that retain or create natural streamways, some areas along project alternatives may actually benefit from construction. Build Alternatives will not impede the migration of birds.

Splitting terrestrial communities into smaller tracts is another impact of project construction. New openings and edges enable certain terrestrial plant and animal species that are adapted to such areas to invade the forest. Forest "edge species" often displace forest interior species through competition for food and nesting areas, predation and nest parasitism. Increased light penetration into the remaining forest may result in a change in the terrestrial plant and wildlife communities. Alternative 3 splits upland habitat over Chestnut Mountain with the proposed parkway cutting the oak-hickory woodland between existing WV 20 and the CSX rail line for approximately 2,388 meters (8,500 feet). Alternatives 2 and 3 split farmland and upland habitat types to a small degree behind Richmond Bottom as the proposed parkway will leave existing Route 26 for approximately 1,676 meters (5,500 feet) to follow a new course behind Richmond Bottom, an area already partially developed. Option 2D/3A which essentially follows existing Route 26 through Richmond Bottom will avoid splitting farmland and upland habitat types.

4.6.1.4 Potential Secondary and Cumulative Impacts

Secondary impacts to terrestrial habitat will likely result with increased human access and activity in the project study area. Loss of terrestrial habitat will occur with new development, however, these losses will be tempered within the parkway corridor as LMS performance standards are implemented, maintaining buffers along the New River, streams and wetlands and protecting trees larger than 15 centimeters (six inches) in diameter.

If, in the future, Route 26 is improved to similar standards as west side parkway alternatives (to provide access to Sandstone Falls) cumulative impacts to old fields, farmland and upland vegetation will result. Cumulative impacts to terrestrial habitat would occur related to Route 26 improvements for the No-Build Alternative and for portions of Route 26 for Alternatives 3 and 4.

4.6.1.5 Potential Mitigations

Avoidance of sensitive and/or undisturbed terrestrial habitat through alignment alteration is the primary mitigation measure. When avoidance is not possible, other mitigation measures for impacts on terrestrial habitat consist of preserving existing vegetation, quickly revegetating all disturbed areas, and avoiding habitat during breeding and nesting seasons. Where vegetation must be cleared or disturbed, the area of disturbance will be minimized. This includes restricting all construction-related traffic to the established construction zone. Disturbed areas will be replanted with appropriate indigenous plant species or other species as appropriate based on consultations with the WVDNR. Use of bridges for perennial stream crossings and bottomless culverts for intermittent stream crossings would allow small mammals and other wildlife species continued access to the floodplain and the New River, and should aid in the protection of streamside vegetation and wildlife habitat. Indirect impacts, such as increased human access and the associated trampling of habitat, will be lessened through implementation and enforcement of the LMS and by NPS management in the project study area.

For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.6.2 Aquatic Habitat

As a FWS Resource Category I, the New River provides critical habitat for many species of birds, fishes, mussels and invertebrates. Thus, primary concerns associated with aquatic habitats in the project study area relate to the need to protect these species from adverse impacts that may be associated with parkway construction, operation and management. As stream habitat complexity has been positively correlated with fish species diversity (Gorman and Karr 1978; Schlosser 1982), conditions that reduce habitat complexity, such as the removal or burial of

gravels, coarse sediments and vegetation and increased stream scouring and sedimentation, need to be identified and avoided or minimized.

4.6.2.1 Methodology

Data collection and analyses were based on studies conducted in the New River gorge by various authors including the Virginia Cooperative Fish and Wildlife Unit and the Virginia Tech Department of Fisheries and Wildlife Sciences (Buhlmann and Vaughan 1987), by Pauley (1993), and, via consultation with FWS, WVDNR and NPS personnel.

4.6.2.2 Affected Environments

Concentrations of wintering waterfowl, including Canada geese, widgeon, gadwall and mallards, were observed directly above Sandstone Falls during 1984 and 1985 (Buhlmann and Vaughan 1987). This area is relatively shallow and provides dabbling (puddle) ducks, including green-wing and blue-wing teal, accessibility to invertebrates and aquatic plants such as water willow. Diving ducks utilize the more open, deeper pools in the New River. Common winter species include flocks of goldeneye and hooded merganser. Wading birds, such as green-backed heron and great blue heron, use river banks for feeding and cover during the summer months. Shorebirds, including spotted sandpiper and killdeer, were frequently observed foraging along the muddy banks of the river. Six species of hawks, two species of vultures, three species of owls, osprey and golden eagle were observed in the NRGNR at least once during the two-year study period. Aquatic furbearing mammals inhabiting the New River gorge include beaver, muskrat and mink; all three species are common throughout the project study area (Buhlmann and Vaughan 1987).

Approximately 30 species of fishes were identified by Buhlmann and Vaughan (1987) in or near the project study area. Practically all species of warm water game fish found in the state are present in the New River, including largemouth and smallmouth bass, spotted bass, yellow perch, striped bass, hybrid striped bass, crappie, sunfish, catfish and bigmouth chub. The entire river has been designated a potential or existing spawning area due to its good flow and bottom surface. The riparian cover, pools and riffles are considered desirable habitat for fish to rest and feed (Grafton and Grafton 1980). Buhlmann and Vaughan (1987) report that the highest densities offish are supported in snag and edge riffle habitats and that some species, such as the endemic big mouth chub, have narrow habitat requirements for spawning. Bigmouth chub need areas with plenty of small to large gravel, shallow depths and moderate velocity, typical of shallow riffle and run areas.

In a biological survey of the river (Stauffer 1980), six species of darters and minnows were identified as endemic to the New River. Leonard (1984) also found that darters and longnose dace were abundant in less human impacted (4th and 5th order) streams in the region. Lick

Creek was the only stream sampled within the project study area and here blacknose dace, creek chub, stoneroller, fantail darter, bluntnose minnow and northern logsucker were the most common species found (Leonard 1984).

Blackbelly and green salamanders, various toads, frogs and turtles, including box turtles, stinkpots and snapping turtles, were frequently found in the area. During the 1984-85 study by Buhlmann and Vaughan (1987), few salamanders were found in riparian habitat types since they probably do not colonize sites that are frequently flooded. The greatest numbers and diversity of salamanders were found in tributary streams. These stream channels also support seven species of freshwater mussels and a large colony of eastern river cooter turtles, a rare state species (Buhlmann and Vaughan 1987). In addition, many other reptiles and amphibians inhabit the project study area and commonly frequent both terrestrial and aquatic habitat types. Buhlmann and Vaughan (1987) report that some species of newts, frogs, salamanders and other amphibians utilize semi-permanent bodies of water (such as potholes and roadside ditches) for breeding. Aquatic habitat includes the New River, intermittent and perennial streams, marshes, permanent ponds, ditches, puddles on old roads and seeps (Pauley 1993).

Mussels reside in all reaches of the NRGNR from Hinton downstream to beyond the project study area. Mussel beds that contain all seven living species (known to occur in the NRGNR) include a small bed between two islands south of Brooks Branch, and a bed at the lower end of Brooks Island. The mussel bed south of Brooks Branch harbors the highest densities of elktoes, wavy-rayed lampmussels and pocketbooks in the NRGNR (Buhlmann and Vaughan 1987).

4.6.2.3 Potential Direct Impacts

Potential direct impacts affecting aquatic habitat include habitat destruction due to project construction, disturbance of spawning grounds and the filling or restricting of streams that serve as vertebrate habitat. A reduction in water quality resulting from construction related sedimentation and polluted roadway stormwater runoff could adversely affect aquatic habitat. Fuller (1974) indicates that silts and other fine particles, settling out over mussel beds, can lead to the elimination of mussel beds through interference of gill functioning and the creation of unsuitable substrates. Wright and Szluha (1980) state that when silt fills the interstices of gravel, invertebrate habitat is reduced and fish spawning habitat eliminated.

Direct effects on a particular habitat type (terrestrial or aquatic) may have indirect impacts on adjacent or downstream habitat. Removal of existing bridges and culverts, renovation of existing bridges and culverts, and construction of bridges, culverts and the roadway in the vicinity of streams and the New River could adversely impact aquatic habitat through sedimentation and the disturbance and/or removal of existing aquatic vegetation. Disturbance and/or removal of streamside vegetation will increase erosion and sedimentation, alter stream microclimates, and

impact existing terrestrial and aquatic plant and animal habitat in and adjacent to streams, wetlands and the New River.

Alternatives 2A, 2B, 2C and 3 each include one bridge crossing over wetlands and the New River. Alternatives 4A, 4B and 4C each involve two bridge crossings over wetlands and the New River (see Section 4.3 Floodplains and Water Resources and Section 4.4 Wetlands for more information on stream and wetland impacts that may affect aquatic habitat). No other direct impacts are anticipated.

Additional impacts are possible where river- and stream-related (terrestrial) habitats are involved (see Section 4.6.1 Terrestrial Habitat). Alternatives 2B, 2C, 4B and 4C have the greatest potential to impact river and stream-related aquatic habitat (near the I-64 bridge) due to these alternatives close proximity to such habitat. All Build Alternatives have some potential for impacts related to sediment laden stormwater runoff initiated during construction, although erosion and sedimentation will be minimized through the appropriate use of erosion control measures.

4.6.2.4 Potential Secondary and Cumulative Impacts

Potential secondary impacts resulting from the operation and maintenance of the proposed parkway include species displacement or decline due to degradation of the surrounding area from increased human activity. All Build Alternatives are expected to increase human activity in or adjacent to aquatic habitat and reduce water quality to some degree. However, land management controls associated with the LMS should have a positive effect on aquatic resources within the project study area. For additional information on water quality impacts, see Section 4.3 Floodplains and Water Resources.

4-6.2.5 Potential Mitigations

Project construction activities will be scheduled as necessary to avoid critical fish-spawning and other aquatic wildlife breeding periods in nearby waters. Riparian vegetation will be removed only where necessary, and disturbed areas will be revegetated with appropriate indigenous, non-invasive plant species as soon as possible to minimize surface erosion and sedimentation, and to replace valuable aquatic habitat and cover.

Use of bridges for perennial stream crossings and bottomless culverts for intermittent stream crossings should allow small aquatic mammals and other aquatic wildlife species continued access to the floodplain and the New River, and should aid in the protection of streamside vegetation and wildlife habitat. Indirect impacts, such as increased human access and the associated disturbance of aquatic habitat, will be lessened through implementation and

enforcement of the LMS and by NPS management in the area. For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.7 RARE, THREATENED OR ENDANGERED SPECIES

Endangered and threatened species are protected by federal law through the Endangered Species Act (ESA) of 1973 (PL93-205, Dec. 28, 1978, as amended through the 100th Congress). The ESA provides the following definitions:

- Endangered Species:** any species which is in danger of extinction throughout all or a significant portion of its range.
- Threatened Species:** any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The federal status or ranking of plant and animal species is described as follows:

Rank	Description
LE	(listed as endangered)
LT	(listed as threatened)
PE	(proposed to be listed as endangered)
PT	(proposed to be listed as threatened)
CL	(candidate for listing)
SC	(species of concern)

The ranking system of The Nature Conservancy has been used for the global ranking of plant and animal species, and by West Virginia for the state ranking of plant and animal species. This system is made up of five rankings which are based on the number of known occurrences of the species in the state (B. McDonald, WVDNR, personal communication, March 1994; McDonald 1995):

Rank	Known Occurrences
1	(1 to 5)
2	(6 to 20)
3	(21 to 100)
4	(apparently secure)
5	(demonstratively secure)

The global ranking of a species as "rare" is applied to plant and animal species having fewer than 100 known occurrences globally. West Virginia's classification of a species as "rare" is applied to plant and animal species having fewer than 100 known occurrences in West Virginia. Such rare species in the state are included on the West Virginia Natural Heritage Program (WVNHP) Rare Plant/Animal lists. West Virginia has no endangered species legislation; therefore, the rare plant/animal list is informal and not legislatively approved (Rouse and McDonald 1986).

4.7.1 Plants

There are no records that federally-listed threatened or endangered plant species inhabit the project study area (Rouse and McDonald 1986; WVNHP 1989; W. Tolin, Endangered Species Specialist, FWS, personal communication, July 1996).

Several plant species that are federally-listed or are species of concern (SC) have been found near the project study area or inhabit an area that includes the New River gorge. These species include: Virginia spirea (*Spiraea virginiana*), listed as threatened (LT); and butternut (*Juglans cinerea*), smoke hole bergamot (*Monarda fistulosa* var. *brevis*) and rock skullcap (*Scutellaria saxatilis*), each designated as a species of concern (SC) (Rouse and McDonald 1986; Clower 1993; Tolin, p.c., July 1996).

Eighteen plant species that are rare at the state level and one species, bittercress (*Cardamine flagellifera*), with fewer than 100 occurrences at the global level, have been found within the project study area (Rouse and McDonald 1986; WVNHP 1989; McDonald 1994).

4.7.1.1 Methodology

Three federal sources (50 CFR 17 Part 17 *Endangered and Threatened Plant and Animal Taxa, Proposed Rule*, February 28, 1996; 50 CFR 17.11 and 17.12, *Endangered and Threatened Wildlife and Plants*, August 20, 1994; and 50 CFR Part 17, *Plant Taxa for Listing as Endangered or Threatened Species, Notice of Review*, September 30, 1993) and studies by the NPS and WVNHP (Rouse and McDonald 1986; Pauley 1993; WVNHP 1994) were used to determine the occurrence of rare, threatened or endangered plant species within or near the project study area.

4.7.1.2 Affected Environments

The WVNHP list of rare plants known to exist within the project study area and their general locations are indicated in Table 4.7.A.

4.7.1.3 Potential Direct Impacts

There are no federally-listed plant species known to exist within the project study area.

Of the plants on the WVNHP list (state rare or state listed) known to exist within the project study area, a sedge (*Carex molestus*) has the potential to be directly impacted. The location of this plant is on the west side of the river north of Brooklin. It may be impacted by Alternatives 2 and 3. Other WVNHP rare plants have the potential to exist within the project study area and be directly impacted by project alternatives.

TABLE 4.7.A WVNHP RARE PLANT SPECIES IN THE PROJECT STUDY AREA

<u>Site Name</u>	<u>Plant Species</u>
Brooklin	<i>Carex molesta</i> (sedge)* <i>Eleocharis compressa</i> (spikerush)
Camp Brookside	<i>Aristida purpurascens</i> (three-awn grass) <i>Cardamine flagellifera</i> (bittercress) <i>Carex physorhycha</i> (sedge) <i>Carex, umbellata</i> (sedge) <i>Carex woodii</i> (sedge) <i>Coreopsis pubescens</i> (hairy tickseed) <i>Cyperus refractus</i> (nutgrass) <i>Eleocharis compressa</i> (spikerush) <i>Galactia volubilis</i> (milk pea) <i>Hypericum denticulatum</i> (coppery St. Johnswort) <i>Melica mutica</i> (two-flowered melic grass) <i>Stipa avenacea</i> (black-seeded needle grass)
Sandstone Falls	<i>Aristida purpurascens</i> (three-awn grass) <i>Cardamine flagellifera</i> (bittercress) <i>Helianthus dowellianus</i> (McDowell's sunflower) <i>Rotala ramosior</i> (toothcup) <i>Sporobolus clandestinus</i> (dropseed) <i>Fimbristylus annua</i> (sedge) <i>Melica mutica</i> (two-flowered melic grass) <i>Pycnanthemum loomisii</i> (Loomis' mountain mint)

Source: Information with asterisk (*) from Rouse and McDonald 1986; all other information from McDonald 1994.

Following selection of the preferred alternative, site-specific studies by a qualified contractor will be considered to locate any rare, threatened or endangered plant species that might be impacted. The determination of scope of work and selection of a qualified contractor would then involve consultation with appropriate federal and state agencies with regulatory oversight responsibilities in the area of rare, threatened or endangered species management.

If the rare, threatened or endangered plant species site-specific study finds federally-designated species, a biological assessment (BA) will be prepared regarding the impacts of the project on such species pursuant to Section 7(c) of the ESA. The purpose of the BA is to determine whether or not any such species and habitat are likely to be adversely affected by the project and

is designed to assist federal agencies in determining if formal consultation or a conference is required. Based on current information, the FWS believes that none of the proposed alternatives would result in significant impacts to federally-listed or candidate species. Therefore, no BA or further Section 7 consultation under the ESA (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq) is required with the FWS (Clower 1995). Should project plans change or if additional information on listed or candidate species becomes available, this determination may change.

4.7.1.4 Potential Secondary and Cumulative Impacts

WVNHP rare plant species, where they exist, could potentially be damaged, taken or destroyed as a result of increased human activities along the parkway. Further study would be necessary to ascertain the level of secondary and cumulative impacts to rare plants resulting from increased human activity along the parkway. Further studies will be considered following selection of a preferred alternative.

4.7.1.5 Potential Mitigations

If subsequent information indicates that rare, threatened or endangered plant species in the project study area may be impacted by the project, then site-specific surveys will be conducted for the preferred alternative. In the event that rare, threatened or endangered plant species are directly impacted by the preferred alternative, appropriate shifts in alignment will be considered to prevent the impact. If realignment is not possible to prevent the impact, consideration would be given as to whether the plant(s) should be removed and replanted in another location. Relocation will only be considered if available, unoccupied habitat exists nearby, if the cost of species relocation is not prohibitive and if relocation is otherwise deemed feasible by the WVDNR, NPS and FWS (Felton 1995). As the relocation of rare, threatened or endangered plants is generally considered an "incidental taking", a permit will be required and would be sought before plants are removed from existing locations.

Potential secondary and cumulative impacts to rare, threatened or endangered plant species arising from increased human activities along the parkway will be minimized by limiting, focusing or controlling visitor access within the parkway corridor. Development of proposed parkway recreation facilities, such as overlooks, trailheads and river access points, will occur in areas away from rare species or in ways that otherwise minimize the chance for loss from construction and visitor trampling. The proper siting of additional parkway recreation facilities would help minimize potential impacts by concentrating activities in designated areas suitable for such development and away from rare, threatened or endangered plant species (McDonald and Trianosky 1995). For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.7.2 Animals

There are no records that federally-listed threatened or endangered animal species inhabit the project study area (WVNHP 1990). The elktoe mussel (*Alasmodonta marginatd*) is a "species of concern" as classified by the FWS. The elktoe mussel has been found in the project study area in a riffle area in the New River above Brooks Falls (W. Tolin, Endangered Species Specialist, FWS, personal communication., September 1995).

Several animal species that are federally-listed or are species of concern (SC) have been found near or inhabit a range that includes the project study area. Species with the potential to exist in the project study area include: Peregrine Falcon (*Falco peregrinus anatum*) and Indiana bat (*Myotis sodalis*) listed as endangered (LE); Bald Eagle (*Haliaeetus leucocephalus*) listed as threatened (LT); and, Cerulean Warbler (*Dendroica ceruled*), southeastern big-eared bat (*Plecotus rafinesquii*), Allegheny woodrat (*Neotoma floridana magister*) and green floater mussel (*Lasmigona subviridis*) listed as species of concern (SC) (USDOI1982; FWS 1987; Clower 1993; Clower 1995; Tolin, p.c., July 1996).

Seven WVNHP rare animal species have been found within the project study area (WVNHP 1990). These WVNHP rare animal species include the Atlantic three-tooth snail (*Triodopsis juxtidens*), New River shiner (*Notropis scabriceps*), golden mouse (*Ochrotomys nuttall*), eastern river cooter (*Pseudemys c. concinna*), blackbelly salamander (*Desmognathus quadramaculata*), Jefferson salamander (*Ambystoma jeffersonianum*) and green salamander (*Aneides aeneus*) (WVNHP 1990; Pauley 1993).

4.7.2.1 Methodology

Three federal sources (50 CFR 17 Part 17 *Endangered and Threatened Plant and Animal Taxa, Proposed Rule*, February 28, 1996; 50 CFR 17.11 and 17.12, *Endangered and Threatened Wildlife and Plants*, August 20, 1994; and 50 CFR Part 17, *Animal Candidate Review for Listing as Endangered and Threatened Species: Proposed Rule*, November 15, 1994) and studies by the NPS and WVNHP were used to determine the occurrence of rare, threatened or endangered animal species within or near the project study area (Rouse and McDonald 1986; WVNHP 1990; Pauley 1993).

4.7.2.2 Affected Environments

Several fresh dead specimens of the elktoe mussel (*Alasmodonta marginatd*) were collected from a muskrat midden located approximately 0.8 kilometers (0.5 miles) above Brooks Falls on the west side of the New River; live specimens are expected to inhabit ledges within the long shallow pool between Brooks Falls and Brooks Branch, and areas near emergent riverine wetlands on the New River (W. Tolin, p.c.).

WVNHP rare animals known to exist within the project study area are indicated in Table 4.7.B.

TABLE 4.7.B WVNHP RARE ANIMAL SPECIES IN THE PROJECT STUDY AREA

<u>Site Name</u>	<u>Animal Species</u>
Brooklin Sandstone	<i>Triodopsis juxtident</i> (Atlantic three-tooth snail)
Falls	<i>Notropis scabriceps</i> (New River shiner) <i>Ochrotomys nutalli</i> (golden mouse)
Barksdale/Brooks	<i>Pseuddemys c. concinna</i> (eastern river cooter)
Kates Branch	<i>Ambystomajeffersonianum</i> (Jefferson salamander) <i>Desmognathus quadramaculata</i> (blackbelly salamander)
Mill Branch	<i>Desmognathus quadramaculata</i> (blackbelly salamander)
Big Branch	<i>Desmognathus quadramaculata</i> (blackbelly salamander)
Fall Branch	<i>Aneides aeneus</i> (green salamander) <i>Desmognathus quadramaculata</i> (blackbelly salamander)
Northwest of Brooks (stream E-P6).	<i>Desmognathus quadramaculata</i> (blackbelly salamander)

Source: Pauley 1993; WVNHP 1990; WVNHP 1994.

4.7.2.3 Potential Direct Impacts

The only federally-designated species known to live within the project study area is the elktote mussel (*Alasmidonta marginata*) classified as a species of concern (SC) by the FWS. As the location where this mussel lives (between Brooks Falls and Brooks Branch on the New River) is beyond the construction limits for the Build Alternatives, it is expected that the elktote mussel will not be directly impacted by the project, although it is possible that sediment and roadway runoff could impact the elktote mussel.

The FWS has recently become concerned about summer habitat of the Indiana bat (*Myotis sodalis*) and are requesting surveys be done to determine if the bats summer in project study areas. Due to the concern about the Indiana bat summer habitat, DOH will consider performing

surveys as required to address FWS concerns. Indiana bat surveys are presently being done in several regions of the state by various organizations to determine those areas used as summer habitat. As this information is obtained, the FWS will be updating its database and this information will be utilized to determine the need for future surveys in the project study area.

Other federally-listed species and species of concern (SC) have the potential to occur in the project study area and could be directly impacted by the project. Additional site specific studies will be done to determine the precise relationship between project work and federally-designated species if it is thought that such species could be impacted by the project.

Of the WVNHP rare animal species known to exist within the project study area, all have some potential to be directly impacted. Direct impacts to WVNHP rare animal species will occur only if these species dwell within the construction limits of the preferred alternative or if these species are otherwise impacted during project construction. The blackbelly salamander has been found in five perennial streams in the project study area which include one stream on the east side of New River and four streams on the west side of New River. These streams are crossed by the No-Build Alternative and all Build Alternatives. Alternative 2 crosses four of the five streams, Alternative 3 crosses two of the five streams, and Alternative 4 crosses two of the five streams. Direct impacts to the blackbelly salamander are possible for all Build Alternatives where drainage structures will be renovated or constructed at perennial streams identified as blackbelly salamander habitat. There will be no direct impacts to the blackbelly salamander for the No-Build Alternative.

The New River shiner and golden mouse were found at Sandstone Falls on the west side of New River. Alternatives 2 and 4 will follow an alignment that passes through the Sandstone Falls area but direct impacts to these species are unlikely as these project alternatives will follow an alignment that stays near the existing roadway centerline.

The eastern river cooter, found on the east side of New River, may be impacted by Alternative 4; however, as Alternative 4 will follow an alignment that stays near the existing roadway centerline, direct impacts to this species are unlikely.

The green salamander, found at Fall Branch on the west side of New River, may be impacted by Alternatives 2 and 4 as the existing bridge structure which spans Fall Branch will be renovated in conjunction with construction of these project alternatives.

The Atlantic three-tooth snail, found near the community of Brooklin on the west side of New River, may be impacted by Alternatives 2 and 3.

Other WVNHP rare animal species have the potential to exist within the project study area and be directly impacted by project alternatives. Following selection of the preferred alternative,

site-specific studies by a qualified contractor will be considered to locate any rare, threatened or endangered animal species that might be impacted. The determination of the scope of work and selection of a qualified contractor would then involve consultation with appropriate federal and state agencies with regulatory oversight responsibilities in the area of rare, threatened or endangered species management.

If the rare, threatened or endangered animal species site-specific study finds federally-designated species, a biological assessment (BA) will be prepared regarding the impacts of the project on such species pursuant to Section 7(c) of the ESA. The purpose of the BA is to determine whether or not any such species and habitat are likely to be adversely affected by the project and is designed to assist federal agencies in determining if formal consultation or a conference is required. Based on current information none of the proposed alternatives would result in significant impacts to federally-listed or candidate species. Therefore, no BA or further Section 7 consultation under the ESA (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq) is required with the FWS. Should project plans change or if additional information on listed or candidate species becomes available, this determination may change.

4.7.2.4 Potential Secondary and Cumulative Impacts

Federally-listed species of concern (SC) and WVNHP rare animal species, where they exist, could potentially be damaged, taken or destroyed as a result of increased human activities along the parkway. Further study would be necessary to ascertain the level of potential secondary and cumulative impacts to federally-listed species of concern (SC) and WVNHP rare animal species resulting from increased human activity along the parkway.

4.7.2.5 Potential Mitigations

If subsequent information indicates that rare, threatened or endangered animal species may be impacted by the project, then site-specific surveys will be conducted for the preferred alternative. In the event that rare, threatened or endangered animal species are directly impacted by the preferred alternative, appropriate shifts in alignment will be considered to prevent the impact. If realignment is not possible, consideration will be given as to whether the animal or animals should be removed and relocated to another location of the same habitat type. Relocation would only be considered if available, unoccupied habitat exists nearby, if the cost of species relocation is not prohibitive and if relocation is otherwise deemed feasible by the WVDNR, NPS and FWS (Felton 1995). To date, the NPS has indicated that, generally, relocation of listed animal species is not an acceptable mitigation strategy (K. Stephens, p.c.).

Prior to issuance of the FEIS, DOH will coordinate with the FWS to determine if surveys need to be performed related to Indiana bat (*Myotis sodalis*) summer habitat. Survey and mitigation techniques may include mist netting of strategic areas at appropriate times as identified by the

WVDNR, FWS, NPS and others. All reasonable mitigation measures will be considered if Indiana bat habitat could be affected by the project. Clearing of potential roost trees along the proposed roadway alignment during the winter (while the Indiana bat is in hibernating in caves) could be employed if WVDNR, FWS and NPS concur that this is a reasonable mitigation measure.

Potential secondary and cumulative impacts to rare, threatened or endangered animal species arising from increased human activities along the parkway could be minimized by limiting, focusing or controlling visitor access within the parkway corridor. Development of proposed parkway recreation facilities, such as overlooks, trailheads and river access points, will occur in areas away from rare species or in ways that otherwise minimize the chance for loss from construction and visitor disturbance. The proper siting of additional parkway recreation facilities would help minimize potential impacts by concentrating activities in designated areas suitable for such development and away from rare, threatened or endangered animal species.

Mitigations associated with direct impacts to perennial streams that are known to support WVNHP rare animal species are discussed in Section 4.3.3.5. For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

4.7.3 Unique Habitat

Rare plant and animal species are reported to occur in nearly every habitat of the NRGNR. The majority of rare species, however, are believed to be restricted to five general habitats: the New River; wetlands; tributary streams; Appalachian River Flatrock Communities; and sandstone cliffs (Rouse 1985; Rouse and McDonald 1986; WVNHP 1989).

Rare, threatened or endangered species habitats are discussed in the following sections: Section 4.6 Terrestrial and Aquatic Habitat; Section 4.4 Wetlands; and Section 4.3 Floodplains and Water Resources. Appalachian River Flatrock Communities and sandstone cliff habitat are discussed within this section.

4.7.3.1 Methodology

Appalachian River Flatrock Communities and sandstone cliffs were identified based on studies conducted by Rouse and McDonald (1986) and WVNHP (1989). Sandstone cliffs were identified based on studies by Rouse (1985) and USDOI (1982).

4.7.3.2 Affected Environments

The Appalachian River Flatrock Communities are a particularly unique habitat representing riverside exposures of parent rock (WVNHP 1989). Currently, five sites have been identified in West Virginia, two of which are within the project study area. These are at Sandstone Falls on the west side of the New River and at Camp Brookside on the east side (Rouse and McDonald 1986; WVNHP 1989).

Sandstone cliffs are also considered a unique habitat and are found mostly in the north-central reaches of the NRGNR (USDOI 1982). Only one such sandstone cliff is believed to occur within the project study area and is found on the west side of the New River between Richmond Farm and the I-64 bridge. Although relatively few rare plants have been reported in these habitats, further surveys may uncover additional finds (Rouse 1985).

4.7.3.3 Potential Direct Impacts

There are no potential direct impacts to Appalachian River Flatrock Communities within the project study area.

The sandstone cliffs will be directly impacted by roadway construction for Alternatives 2C and 4C with a New River bridge crossing north of Richmond Island. An excavation area approximately 152 meters (500 feet) in length with heights ranging from 7.6 to 15.2 meters (25 to 50 feet) will be necessary for roadway construction.

4.7.3.4 Potential Secondary and Cumulative Impacts

Appalachian River Flatrock Communities and sandstone cliffs could potentially be degraded or damaged as a result of increased human activities in the project study area.

4.7.3.5 Potential Mitigations

Potential direct impacts to the sandstone cliffs could be avoided by choosing one of the other two alignment options, Alternatives 2 A/4A or Alternatives 2B/4B, for crossing the New River in the northern portion of the project study area. Minimizing impacts to the sandstone cliffs is possible but will be difficult for Alternatives 2C and 4C. However, because these sandstone cliffs were previously excavated in order to construct Route 27/2 along the west side of the New River, it is possible that impacts to the cliffs can be lessened by excavating in ways that retain more natural functions, patterns and appearances of the rock face.

Potential secondary and cumulative impacts to Appalachian River Flatrock Communities and sandstone cliffs arising from increased human activities along the parkway could be minimized

by limiting, focusing and/or controlling visitor access within the parkway corridor. Development of proposed parkway recreation facilities, such as overlooks, trailheads and river access points, will occur in areas away from these unique habitats or in ways that otherwise minimize the chance for loss from construction and visitor disturbance. The proper siting of additional parkway recreation facilities would help minimize potential impacts by concentrating activities in designated areas suitable for such development and away from these unique habitats.

The existing NPS boardwalk at Sandstone Falls is an example of how impacts to unique habitats can be minimized through sensitive design interventions. Similar types of construction will be considered where necessary to avoid and/or control access to unique habitats in the project study area.

For more information on mitigation, see Appendix D: Mitigation Strategies and Techniques.

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