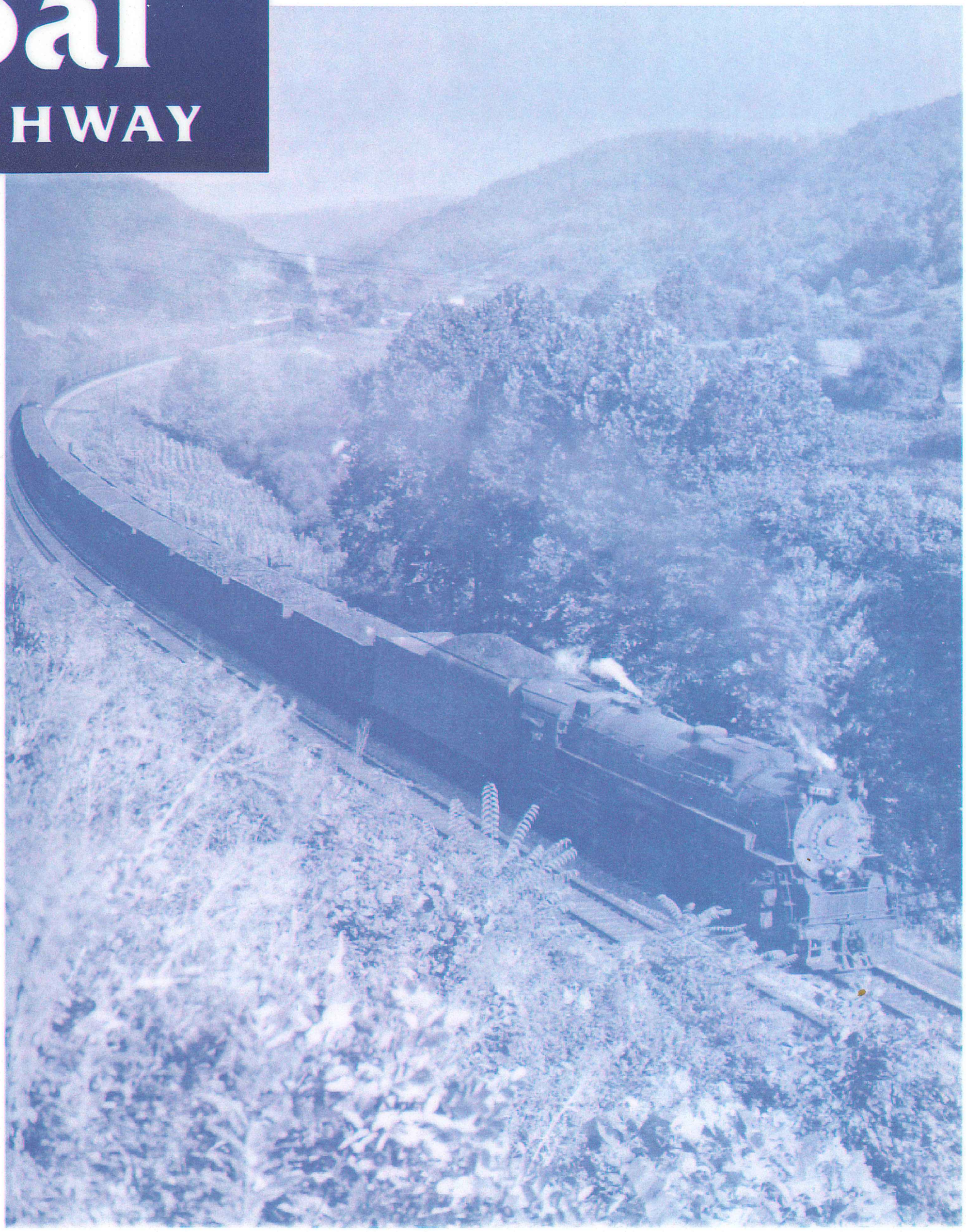
June 2000

King Coal HIGHWAY

Final Environmental Impact Statement



State Project:
X169-SHA/WN-1 03

Federal Project:
DPS-0012(013)

West Virginia Department of Transportation
DIVISION OF HIGHWAYS

FHWA-WV-EIS-99-03-F
State Project: X169-SHA/WN-1 03
Federal Project: DPS-0012(013)

KING COAL HIGHWAY

Final Environmental Impact Statement

Submitted Pursuant to: 42 U.S.C. 4332(2)(c), 23 U.S.C. 128(a),
49 U.S.C. 303(c), and 16 U.S.C. 470(f),
80 Stat. 931, Public law 89-670

U.S. Department of Transportation - Federal Highway Administration
and
West Virginia Department of Transportation - Division of Highways

Cooperating Agencies:
U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and West Virginia State Historic Preservation Office

6/26/00
Date of Approval

Samuel H. Beverage
For West Virginia Department of Transportation

6/26/00
Date of Approval

Thomas J. Smith
For Federal Highway Administration

The following people may be contacted for additional information concerning this document:

Mr. Ben Hark
Environmental Section Chief
Engineering Division
WVDOT - Division of Highways
State Capitol Complex, Building Five
Charleston, West Virginia 25305
(304) 558-2885

Mr. Thomas J. Smith
Division Administrator
Federal Highway Administration
Geary Plaza, Suite 200
700 Washington Street, East
Charleston, WV 25301
(304) 347-5928

This project consists of a proposal to construct an approximately 154 kilometer (96 mile) highway from the vicinity of Williamson, West Virginia to the vicinity of Bluefield, West Virginia. The King Coal Highway will provide a four-lane divided highway with partially controlled access that will address the region's transportation demands and isolation issues. This study evaluates the economic, social, and environmental impacts associated with the construction of the proposed project.

Comments on this FEIS are due by 8/14/00
and should be sent to:

Mr. James E. Sothen
Director, Engineering Division
WVDOT - Division of Highways
State Capitol Complex, Building Five
Charleston, West Virginia 25305

TABLE OF CONTENTS

LIST OF TABLES

LIST OF EXHIBITS

LIST OF APPENDICES
(Bound in Separate Volumes)

Volume I: TRAFFIC/TRANSPORTATION, NATURAL, AND PHYSICAL ENVIRONMENT
Volume II: CULTURAL RESOURCE APPENDIX

GLOSSARY OF COMMONLY USED ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACHP	Advisory Council on Historic Preservation
ADT	Average Daily Traffic
APD	Appalachian Development Highway System
BNA	Block Numbering Area (U.S. Census)
BPD	Barrels Per Day
BTU	British Thermal Unit
CAA	Clean Air Act
CEQ	President's Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
dBA	Decibels on the A-weighted scale
DEIS	Draft Environmental Impact Statement
DHV	Design Hourly Volume
EIS	Environmental Impact Statement
EMS	Emergency Medical Service
USEPA	U.S. Environmental Protection Agency
ERIIS	Environmental Risk Information and Imaging Service
ESPCP	Erosion and Sediment Pollution Control Plan
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Maps
FPPA	Farmland Protection Policy Act
ft	feet/foot
FTA	Federal Transit Administration
GIS	Geographic Information Systems
GPM	Gallons Per Minute
HAZMAT	Hazardous Materials
HEP	Habitat Evaluation Procedure
HSI	Habitat Suitability Index
HU	Habitat Unit
IRA	Improved Roadway Alternative

GLOSSARY OF COMMONLY USED ACRONYMS AND ABBREVIATIONS (continued)

ISTEA	Intermodal Surface Transportation Efficiency Act
km	kilometer(s)
kph	kilometers per hour
LOS	Level of Service
LS	Lump Sum
LUST	Leaking Underground Storage Tank
LWCFA	Land and Water Conservation Fund Act
m	meter(s)
mi	mile(s)
MOA	Memorandum of Agreement
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Category
NAMS	National Air Monitoring System
NEPA	National Environmental Policy Act
NHS	National Highway System
NPL	National Priority List
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O/D	Origin and Destination
OGIS	Oil and Gas Information Service
PA	Preferred Alternative
PEM	Palustrine Emergent Wetland
PFO	Palustrine Forested Wetland
PSS	Palustrine Scrub-Shrub Wetland
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SHPO	State Historic Preservation Officer
SI	Suitability Index
SIC	Standard Industrial Class
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring System
SR	State Route
TAZ	Traffic Analysis Zone
TEA-21	Transportation Equity Act for the 21^{st} Century
TMA	Transportation Management Area
TSM	Transportation Systems Management
USDA	United States Department of Agriculture
USGS	United States Geological Survey
U.S.	United States
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
VA	Virginia
VADEQ	Virginia Department of Environmental Quality

GLOSSARY OF COMMONLY USED ACRONYMS AND ABBREVIATIONS (continued)

VDGIF	Virginia Department of Game and Inland Fisheries
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation
VOC	Volatile Organic Compounds
WHPA	Well Head Protection Areas
WV	West Virginia
WVDEP	West Virginia Division of Environmental Protection
WVDHHR	West Virginia Department of Health and Human Resources
WVDNR	West Virginia Division of Natural Resources
WVDOT	West Virginia Department of Transportation, Division of Highways
WVDCH	West Virginia Division of Culture and History
WVGES	West Virginia Geological and Economic Survey
WVOAQ	West Virginia Office of Air Quality

GLOSSARY OF COMMONLY USED TERMS

Acidity: A measurement of the hydrogen ion concentration of an aqueous solution.

Acid Mine Drainage: Acid drainage from bituminous coal mines containing a high concentration of acidic sulfates, especially ferrous sulfate.

Alignment: Refers to the proposed routing of a Build Alternative.

Alternative: General term that refers to possible approaches to meeting the project purpose and need. Typically refers to the No Build Alternative, the System Wide Improvement Alternatives, the Transit Alternatives, and the Build Alternatives.

Aquifer: A water-bearing unit of permeable rock, sand, or gravel which yield considerable quantities of water to springs and wells.

Attainment: Status of the various pollutants described in the NAAQS.

Benthic: Located on the bottom of a body of water or in the bottom sediments; pertaining to bottom-dwelling organisms.

Biodiversity: The variety and abundance of species, their genetic composition, and the communities, ecosystems, and landscapes in which they occur.

Biotic: Of or pertaining to life and living organisms.

Carbon Monoxide: A colorless, odorless, poisonous gas that is formed as a product of the incomplete combustion of carbon and is emitted directly by automobiles and trucks.

Community Cohesion: The connections between and within communities that are essential for serving the needs of the residents.

GLOSSARY OF COMMONLY USED TERMS (cont.)

Cumulative Impact: An impact on the environment which results from the incremental impact of the action when added to past, present, and reasonably foreseeable future actions.

Environmental Justice: Presidential Executive Order of 12898 requires federal agencies to take into consideration disproportionately high and adverse human health or environmental effects of federal programs and projects on low-income and minority populations.

Floodplain: The portion of a river or stream valley, adjacent to the channel, which is covered with water when the river or stream overflows its banks at flood stage. It is also defined as lowland and relatively flat areas adjoining inland and coastal waters including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Floodway: An area of high flooding risk potential, usually immediately adjacent to a river or stream channel and subject to floodwaters of high velocity. Specifically, the floodway refers to that portion of the floodplain which is effective in carrying flow, within which this carrying capacity must be preserved and when the flood hazard is generally highest.

Groundwater: Naturally occurring water that moves through the ground and underlying rock, at a depth of several feet to several hundred feet.

Habitat Evaluation Procedure: A method created by the USFWS to evaluate the quantity and quality of habitat for selected wildlife species

Historic Archaeological Site: Any subsurface cultural manifestation dated post European contact.

Karst: The occurrence of limestone as the first bedrock unit beneath the soil in which cavities form due to the solubility of limestone under certain conditions. Surface characteristics include sinkholes and sinking streams.

Level of Service (LOS): Operating conditions within a stream of traffic describing safety, traffic interruptions, speed, freedom to maneuver, comfort and convenience. Six levels of service are defined, designated A through F, with A representing the best conditions and F the worst.

Low-income Population: A population whose household income is below the Department of Health and Human Services poverty guidelines.

Nitrogen Oxide: Colorless, sweet-tasting gas emitted directly by automobiles and trucks.

Non-attainment: A condition where a pollutant exceeds the NAAQS two or more times during a year.

Ozone: Unstable blue gas with a pungent odor formed principally in secondary reactions involving volatile organic compounds, nitrogen oxides, and sunlight.

Prehistoric Archaeological Site: Any subsurface cultural manifestation dated to pre-European contact.

Palustrine Emergent Wetland: Wetlands which are characterized by erect, herbaceous vegetation present for most of the growing season (i.e. marshes, wet meadows, fens, sloughs, or potholes).

Palustrine Forested Wetland: Wetlands which are characterized by woody vegetation over 6 meters (20 feet) in height (i.e. swamps or bottomlands).

Palustrine Scrub-Shrub Wetland: Wetlands which are characterized woody vegetation less than 6 meters (20 feet) in height (i.e. pocosins, shrub swamps, or wet thickets).

GLOSSARY OF COMMONLY USED TERMS (cont.)

Physiographic Province: A region which is generally consistent in geologic structure and climate and which has had a unified geomorphic history.

Preferred Alternative: An alternative chosen from those presented in the DEIS which best suits the need and purpose of the proposed action while imposing a minimum of impacts to the social, natural, and physical environment; the identified Preferred Alternative will be presented in the FEIS.

Riparian: Pertaining to anything connected with or immediately adjacent to the banks of a stream.

Secondary Impact: An impact on the environment resulting from the primary impact of the action.

Special Groups: Those groups which have the potential to be specially benefited or harmed by the proposed project.

Transfer Payments: A form of public assistance from the state and federal governments which is not wage or salary income but is still a part of total earnings.

Upland Habitat: Land that has sufficiently dry conditions that hydrophytic vegetation, hydric soils, and/or wetland hydrology are lacking. Any area that is neither a wetland, deepwater aquatic habitat, nor other special aquatic site is considered upland habitat.

Value-Added Coal Products: Coal that has been altered or processed for industrial, commercial, and scientific applications. The value-added cost is the difference between the price at which goods are sold and the cost of the materials used to make them.

Viewshed: All land seen from one static point.

Watershed: A specific geographic area drained by a major stream or river.

Wetland: Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Zone of Saturation: The area found below the water table where water occupies all open space.

COMMONLY USED METRIC CONVERSIONS

Quantity	Metric Unit	English Unit	Factor to Convert Metric Units to English Units
Length	Kilometer (km)	Mile (mi)	Kilometers x 0.62 = Miles
	Meter (m)	Foot (ft)	Meters x 3.28 = Feet
Area	Square Kilometer (km^2)	Square Mile (mi^2)	Sq. Kilometers x 0.39 = Sq. Miles
	Hectare (ha)	Acre (ac)	Hectares x 2.47 = Acres
Volume	Liter (l)	Gallon (gal)	Liters x 0.26 = Gallon
Mass	Kilogram (kg)	Pound (lb)	Kilograms x 2.21 = Pounds
Velocity	Kilometer per Hour (kph)	Mile per Hour (mph)	kph x 0.62 = mph

PROJECT SUMMARY

PROJECT DESCRIPTION

The West Virginia Department of Transportation (WVDOT) in conjunction with the Federal Highway Administration (FHWA) is proposing to construct the 154 kilometer (96 mile) King Coal Highway from the vicinity of Williamson, West Virginia to the vicinity of Bluefield, West Virginia. The western logical termini for the King Coal Highway has been established to be: US 52 at the intersection of US 119 (latitude: 37 degrees, 45 minutes, and 34 seconds/ longitude: 82 degrees, 18 minutes, and 52 seconds). The eastern logical termini is Interstate 77 (I-77) at the US 52/I-77 Interchange (latitude: 37 degrees, 17 minutes, and 03 seconds/ longitude: 81 degrees, 07 minutes, and 32 seconds).

The study area involves the West Virginia counties of Mingo, Logan, McDowell, Wyoming, and Mercer; and Tazewell County, Virginia (Exhibit S-1). While the project is primarily located within the State of West Virginia, two Build Alternatives extended into Virginia for approximately 1.6 kilometers (1.0 mile). The Preferred Alternative, however, is entirely within the state of West Virginia.

The study route (US 52) represents the primary highway system currently utilized within the study area between Williamson and Bluefield, West Virginia. This route not only serves through traffic between the termini, but also serves as the main street with collector movement characteristics through several communities. The study route (US 52) has many geometric constraints that inhibit the smooth flow of traffic. These include varying lane widths, areas of reduced speeds (i.e. 35 towns and 6 school zones), a high percentage of "No Passing Zones", and steep grades.

Improved traveling conditions will benefit people traveling within the study area (i.e. to work or health care facilities) and people traveling through the study area (i.e. coal truck traffic, long distance travel). The proposed 154 kilometers (96 miles) of four-lane, divided highway will also help reduce traffic congestion, accidents, and increase access to local communities.

Note: Throughout this Final Environmental Impact Statement (FEIS), substantive changes from the Draft Environmental Impact Statement (DEIS) are underscored with side bars in the margins.

PROJECT STATUS AND HISTORY

In 1991, Congress enacted the Intermodal Surface Transportation Efficiency Act (ISTEA) which provides federal assistance for highway studies, design, and construction. The ISTEA appropriated an initial $14 million for the King Coal Highway. The project was designated in ISTEA as a high priority segment of a high priority corridor on the National Highway System. The King Coal Highway is the designated I-73/I-74 Corridor in West Virginia. The project is also a component of the State Transportation Improvement Program (STIP) for WVDOT (March 2, 1993). Consequently, WVDOT proceeded with a location study, public informational meetings, Purpose and Need Study (1994), Alternatives Study (1995), Pre-Draft Environmental Impact Statement (PDEIS) (1996), Public Workshops (May, 1998), DEIS (1999), Public Workshops and Hearings (February and March, 2000) and this FEIS.

On June 9, 1998, the President signed into law PL 105-178, the *Transportation Equity Act for the 21st Century* (TEA-21) authorizing highway, highway safety, transit and other surface transportation programs for the next 6 years.

TEA-21 builds on the initiatives established in ISTEA, which was the last major authorizing legislation for surface transportation. This new Act allocated an additional $24.05 million for construction of the King Coal Highway in the state of West Virginia.

The DEIS is based upon technical appendices that inventory social, natural, cultural, and physical resources within the Build Alternatives and the selected Preferred Alternative (PA). These technical appendices are incorporated into the FEIS by reference and have been prepared in accordance with Council on Environmental Quality (CEQ) regulations (40 CFR 1500 et seq.), FHWA regulations (23 CFR 771 et seq.), and the National Environmental Policy Act (NEPA) of 1969. The No Build Alternative, PA and six Build Alternatives, 300 meters (984 feet) wide were analyzed in the DEIS.

Following FHWA approval of the DEIS (December 1999), public meetings and hearings were held in February and March, 2000. After comments on the DEIS were received and considered, this Final Environmental Impact Statement (FEIS) was prepared. The DEIS and FEIS identify impacts within a 300 meter (984 feet) corridor; which is an appropriate level of detail for this project. This FEIS is the final environmental document for this project; a tiered EIS process is not being pursued. However, continued coordination with the resource agencies will occur during the design phase of the project to ensure compliance with identified mitigation commitments.

PROJECT NEED

An analysis of the project need was conducted in accordance with the FHWA's memorandum entitled, *Purpose and Need in Environmental Documents* (1990). The complete results and supporting documentation of this assessment are found in the *King Coal Highway Purpose and Need Study* (WVDOT, 1994). The study concluded that there is a need for the King Coal Highway based on the findings of the *King Coal Highway Purpose and Need Study* (WVDOT, 1994) which are summarized in Table S-1.

ALTERNATIVES

A broad range of alternatives was initially considered for the project. The project alternatives included:

1) System Wide Improvements (i.e., Transportation System Management and Improved Roadway Alternatives)
2) Transit Alternatives (i.e., Mass Transit and Heavy Rail/Freight Transportation)
3) No Build Alternative
4) New Highway or Build Alternatives

Of the alternatives considered for the King Coal Highway, only the Build Alternatives were found to meet the project purpose and need. The No Build Alternative was retained in the analysis of alternatives as a basis of comparison with the Build Alternatives. A complete discussion of the alternatives is included in *Section II: Alternatives* of the DEIS and this FEIS. A brief summary of the No Build Alternative and Build Alternatives is provided below.

NO BUILD ALTERNATIVE

The No Build Alternative consists of a continuation of the existing routes between Williamson and Bluefield, West Virginia. This alternative includes short-term, minor restoration activities such as resurfacing, bridge repairs, and minor widening. These improvements are already a part of the ongoing plan for the continued operation of the existing roadway system.

TABLE S-1
PURPOSE AND NEED SUMMARY

Factor Contributing to Project Need	King Coal Highway Study Conclusions
Current and Future Capacities and Level of Service (LOS) of Existing Transportation Network	Year 2013 projections reveal 90 % of the study route will be operating at or below Level of Service (LOS) D.
Current and Future Transportation Demands (Regional and Local)	Traffic demand exists to support a 4-lane partially controlled access highway through the study area.
Regional and Local System Linkage	King Coal Highway will enhance both regional and local system linkage, as well as modal interrelationships in the region.
Safety and Roadway Deficiencies	Study route has higher than statewide (WV) average accident rates. Roadway deficiencies such as substandard curves and steep grades were identified along most of the study route (US 52).
Social Demands	King Coal Highway will improve access for emergency services as well as improve access to community services.
Economic Demands	King Coal Highway will improve access to the study area and could enhance employment opportunities.
Legislation	The U.S. Congress, through ISTEA, has designated the King Coal Highway as a high priority segment of a high priority corridor on the National Highway System.

Source: USDOT, 1990a.

The existing roadway network is deficient in several ways (safety, travel times, linkage). Motorists will continue to experience inadequate regional and local service as they travel along the study route (US 52). By 2013, 90 % of the study route (US 52) and 13 of 14 intersecting segments will be operating at LOS D or worse.

BUILD ALTERNATIVES

A 5 to 8 kilometer (3 to 5 mile) wide study area was developed for the King Coal Highway during the initial stages of the project. Within the study area, six Build Alternatives approximately 300 meters (984 feet) wide and averaging 154 kilometers (96 miles) in length were developed. Each of the six Build Alternatives (Alternatives 2, 2A, 2B, 2C, 2D, and 2E) are presented in Exhibit S-2.

PREFERRED ALTERNATIVE

The Build Alternatives identified in the Draft Environmental Impact Statement (DEIS) were all initially considered candidates for the Preferred Alternative (PA). The PA is composed of segments from each of the six build alternatives under consideration. Selection of the PA came after careful consideration and assessment of the potential environmental impacts, (social, natural, and physical), and evaluation of public comments received stemming from public workshops held in May 1998, February, 2000, and public hearings in March, 2000.

The PA was selected on the basis of its ability to best facilitate the projects Purpose and Need while minimizing impacts to the natural, physical, and social environments. All of the Build Alternatives presented in the DEIS have similar impacts to the natural and physical environment. In summary, the PA contains similar natural, physical, and socioeconomic impacts to that of the other Build Alternatives. The PA avoids the greatest number of architectural resources and requires the fewest number of business and community facility displacements. The PA also avoids special groups and environmental justice impacts, as do Alternatives 2B, 2D, and 2E. It should be noted that the selection of the PA was "preliminary" and no final decision was made until completion of the public involvement process.

The PA is planned as a four-lane, divided, partially controlled access facility. When completed, the King Coal Highway will incorporate current safety and design standards. Identification of the Preferred Alternative in the DEIS is consistent with Federal Highway Administration (FHWA) and Council of Environmental Quality (CEQ) guidelines and regulations (FHWA Technical Advisory T. 6640.8A; 40 CFR 1502).

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

A summary of environmental consequences associated with each of the six Build Alternatives and the PA is presented in Table S-2.

ONLY PRACTICABLE ALTERNATIVE FINDING

In accordance with Executive Order 11988, Executive Order 11990, and 23 CFR 650 Subpart A, the following discussions document the basis for the finding that the Preferred Alternative is the only practicable alternative and that no practicable alternative exists that can avoid construction in floodplains and wetlands.

FLOODPLAIN FINDING

The construction of the Preferred Alternative will result in unavoidable floodplain encroachments. To the extent practicable, impacts to floodplains have been avoided or minimized. Based on the consideration of impacts and the ability to address the purpose of and need for the project, the Preferred Alternative is the only reasonable and practicable alternative. The proposed action includes all practicable measures to minimize harm to floodplains which may result from such use. Construction of the Preferred Alternative will conform to applicable federal and state floodplain protection standards.

WETLAND FINDING

The construction of the Preferred Alternative will result in unavoidable wetland encroachments. In accordance with the philosophy embodied in the Integrated NEPA/404 Process, impacts to wetlands have been avoided or minimized to the extent practicable. Further efforts to avoid or minimize wetland encroachments will be evaluated during final design. Based on the above considerations, it was determined that there is no practicable alternative to the proposed construction in wetlands and that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. The Army Corps of Engineers has concurred with this finding. (letter dated March 3, 2000 in Section VII of this FEIS).

OTHER STATE AND FEDERAL ACTIONS REQUIRED

Other federal and/or state actions required to implement the proposed action are as follows:

- Section 404 permit approval by the U.S. Army Corps of Engineers for stream and wetland encroachment required for roadway construction. Associated with this permit is the need to obtain Section 401 Water Quality Certification from the West Virginia Division of Environmental Protection.
- Wetlands finding in compliance with Presidential Executive Order 11990, Protection of Wetlands.
- Floodplain finding in compliance with Presidential Executive Order 11988, Floodplain Management.
- National Pollutant Discharge Elimination System Permits.
- Section 106 consultation procedures with the Advisory Council on Historic Preservation for involvement with historic sites on or eligible for the National Register of Historic Places.

OTHER PROPOSED MAJOR ACTIONS

Other proposed federal and state actions in the same geographic area as the King Coal Highway include:

- Coalfields Expressway - This proposed project is approximately 100 kilometer (62 mile) in length from the vicinity of Slate, Virginia to the vicinity of Beckley, West Virginia. The Coalfields Expressway will provide a four-lane divided highway with partially controlled access.
- Shawnee Highway – This proposed project is an approximately 35 kilometer (22 mile) roadway between Three Corners Junction (the intersection of McDowell, Mercer, and Wyoming Counties) and I-77 in the vicinity of Flat Top. The Shawnee Highway will be designed as a two-lane rural arterial road.
- West Virginia Route 65 – This proposed project is an approximately 12 kilometer (7.5 miles) upgrade of WV 65 from the intersection of WV 65/US 119 (near Belo) to US 52 at Naugatuck. The WV 65 improvement project will be designed as a four-lane divided highway.
- I-66 Corridor Study (Kentucky) – This proposed project is approximately 53 kilometers (33 miles) in length from the US 23/119 intersection (south of Pikeville, Kentucky) to the King Coal Highway in the vicinity of Thacker, WV. The proposed project is planned a four-lane, fully controlled access facility in the state of Kentucky. The project is currently in the preliminary planning phase with an expected DEIS in 2001.
- US 460/52 Interchange Project – The proposed project will upgrade the intersection of U.S. Route 460 and U.S. Route 52 in Mercer County, West Virginia. The existing intersection is a signalized at-grade facility which results in increased congestion and reduced safety. The Interchange upgrade will provide for increased safety and reduced congestion for through-traffic and vehicles entering and exiting both highway facilities.

TABLE S-2
BUILD ALTERNATIVE SUMMARY MATRIX

Issue	Alternatives							
	No Build	2	2A	2B	2C	2D	2E	PA
Length								
• Kilometers (Miles)	152 (95)	149 (93)	159 (99)	149 (93)	159 (99)	152 (95)	151 (94)	151 (94)
Preliminary Construction Cost (Millions)[1]	N/A	$1,116	$1,188	$1,116	$1,188	$1,140	$1,128	$1,128
Travel Time (minutes) (Year 2020)	160	86	91	85	91	87	87	87
Displacements[2]								
• Residences	0	256	727	267	738	220	231	277
• Businesses	0	13	120	9	116	12	8	7
• Community Facilities	0	14	32	14	32	12	12	11
Environmental Justice (Disproportionate Impacts)								
• Low-Income Populations	N/A	no	no	no	no	no	no	no
• Minority Populations	N/A	no	no	no	no	no	no	no
Architectural Resources (Over 50 years old)								
• Historic Districts, NRHP Listed	N/A	0	1	0	1	0	0	0
• Potential Individual Resources	N/A	7	5	2	4	3	2	2
• Potential District Resources	N/A	0	2	0	2	0	0	0
• Cemeteries (Not Eligible)	N/A	12	17	7	12	12	7	4
• All Other Resources (Not Eligible)	N/A	64	292	66	294	57	59	73
Archaeological Resources								
• High Probability Areas - Hectares (Acres)	N/A	21 (52)	14 (35)	7 (17)	0 (0)	21 (52)	7 (17)	15 (37)
• Moderate Probability Areas - Hectares (Acres)	N/A	309 (763)	390 (965)	314 (776)	396 (979)	287 (708)	292 (721)	319 (788)
• Low Probability Areas - Hectares (Acres)	N/A	3,829 (9,458)	3,720 (9,188)	3,917 (9,675)	3,808 (9,406)	3,755 (9,275)	3,734 (9,492)	3,885 (9,600)
Air Quality Improvements (Year 2020)								
• Ozone Precursors (Greater than Existing/No Build)	no	no	no	no	yes	no	no	no
• Carbon Monoxide (Exceeds NAAQS)	no	no	no	no	no	no	no	no
Energy Requirements[3] **(Year 2020)**								
Millions of Liters (Fuel) (Millions of Gallons [Fuel])	40.5 (10.7)	37.2 (9.8)	37.9 (10.0)	37.6 (9.9)	38.4 (10.1)	37.9 (10.0)	38.1 (10.1)	38.2 (10.1)
Noise Impacts (Total FHWA and WV Criteria)	N/A	141	577	157	597	142	158	129
Federally-listed Rare, Threatened, Endangered Species (Possible Involvements)	N/A	3	3	3	3	3	3	0[4]
Wetland Impacts – Hectares (acres)	N/A	6.49 (16.05)	1.46 (3.63)	6.44 (15.93)	1.41 (3.51)	6.49 (16.05)	6.43 (15.94)	7.06 (17.44)
Wildlife Habitat Units	N/A	23,439	23,090	24,206	23,911	23,018	23,710	23,655
Intermittent and Perennial Streams								
• Number of Stream Crossings	N/A	107	99	108	100	104	105	108
• Length of Stream Crossings – Kilometers (miles)	N/A	37 (23)	35 (21)	42 (26)	39 (24)	36 (22)	40 (25)	41 (25)
Floodplain Encroachments–Hectares (Acres)	N/A	36 (88)	33 (81)	30 (73)	27 (66)	34 (85)	28 (70)	29 (71)
Prime/State-Wide Important Soils – Hectares (Acres)	N/A	133 (328)	170 (422)	133 (328)	170 (422)	127 (312)	127 (312)	137 (340)
Potential Hazardous Waste Involvements	N/A	6	28	5	27	5	4	2

[1] Does not include right-of-way acquisition and utility relocations.
[2] These figures reflect the number of buildings located within each 1000' corridor. The number of displacements will likely decrease as the actual roadway design progresses.
[3] Includes operational and maintenance energy consumption.
[4] Based on field surveys for federally-listed rare, threatened, and endangered species.

Project Summary Exhibits

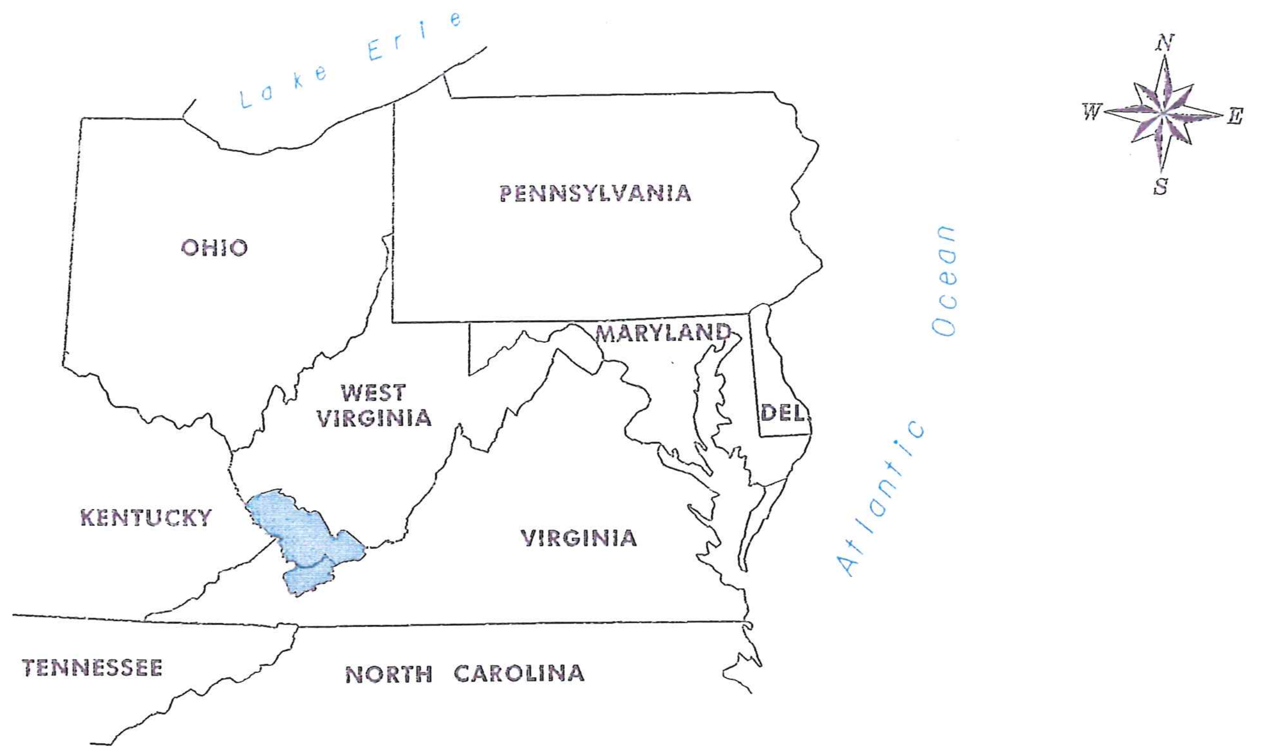


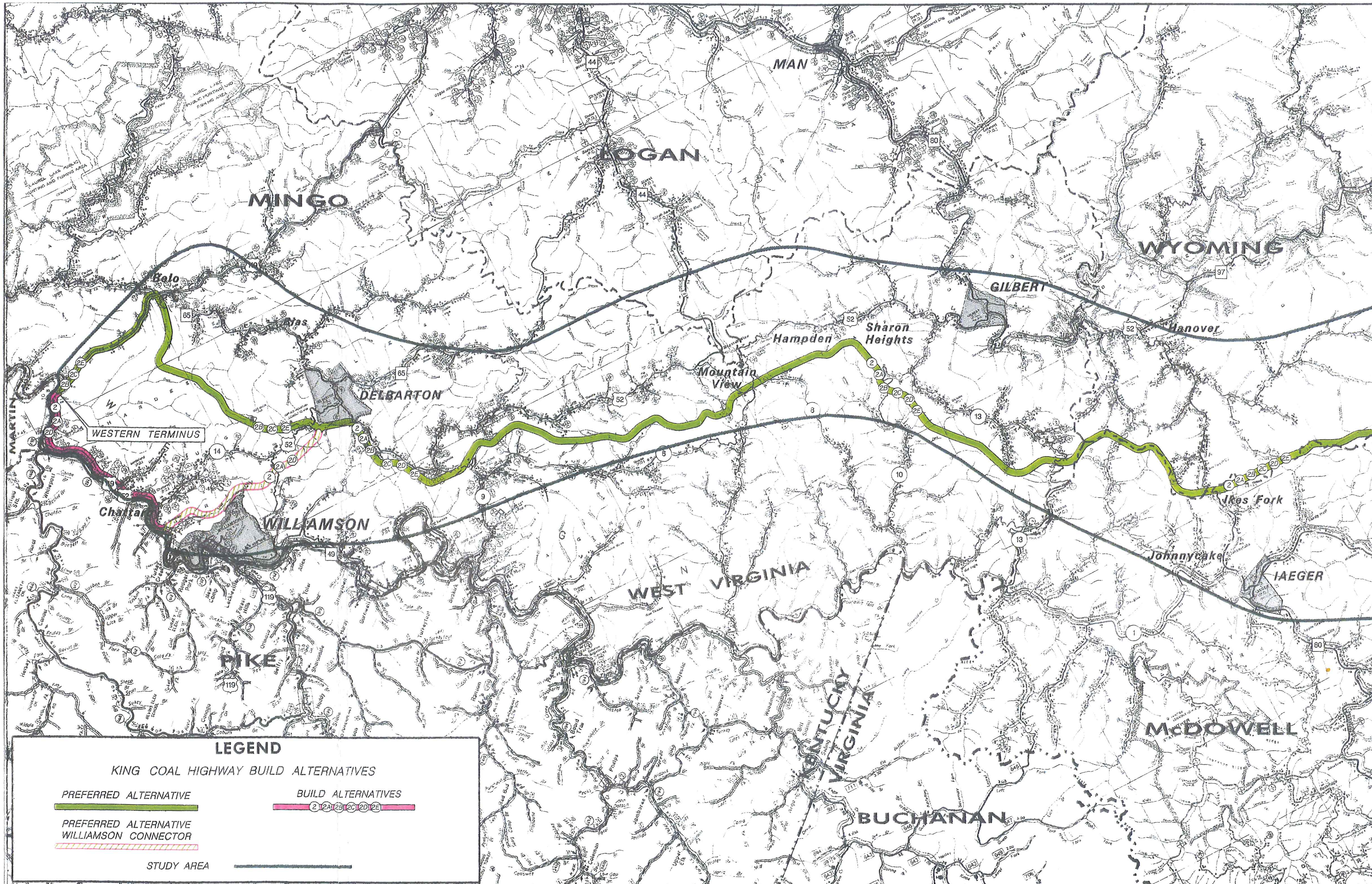
Exhibit S-1

KING COAL HIGHWAY

PROJECT LOCATION

Baker

Not to Scale



MINGO
LOGAN
MAN
WYOMING
GILBERT
Hanover
Belo
Hampden
Sharon Heights
Mountain View
DELBARTON
WESTERN TERMINUS
Chattaroy
WILLIAMSON
WEST VIRGINIA
KENTUCKY
VIRGINIA
PIKE
MARTIN
Ikes Fork
Johnnycake
IAEGER
McDOWELL
BUCHANAN
LEGEND
KING COAL HIGHWAY BUILD ALTERNATIVES
PREFERRED ALTERNATIVE
BUILD ALTERNATIVES
2 2A 2B 2C 2D 2E
PREFERRED ALTERNATIVE WILLIAMSON CONNECTOR
STUDY AREA

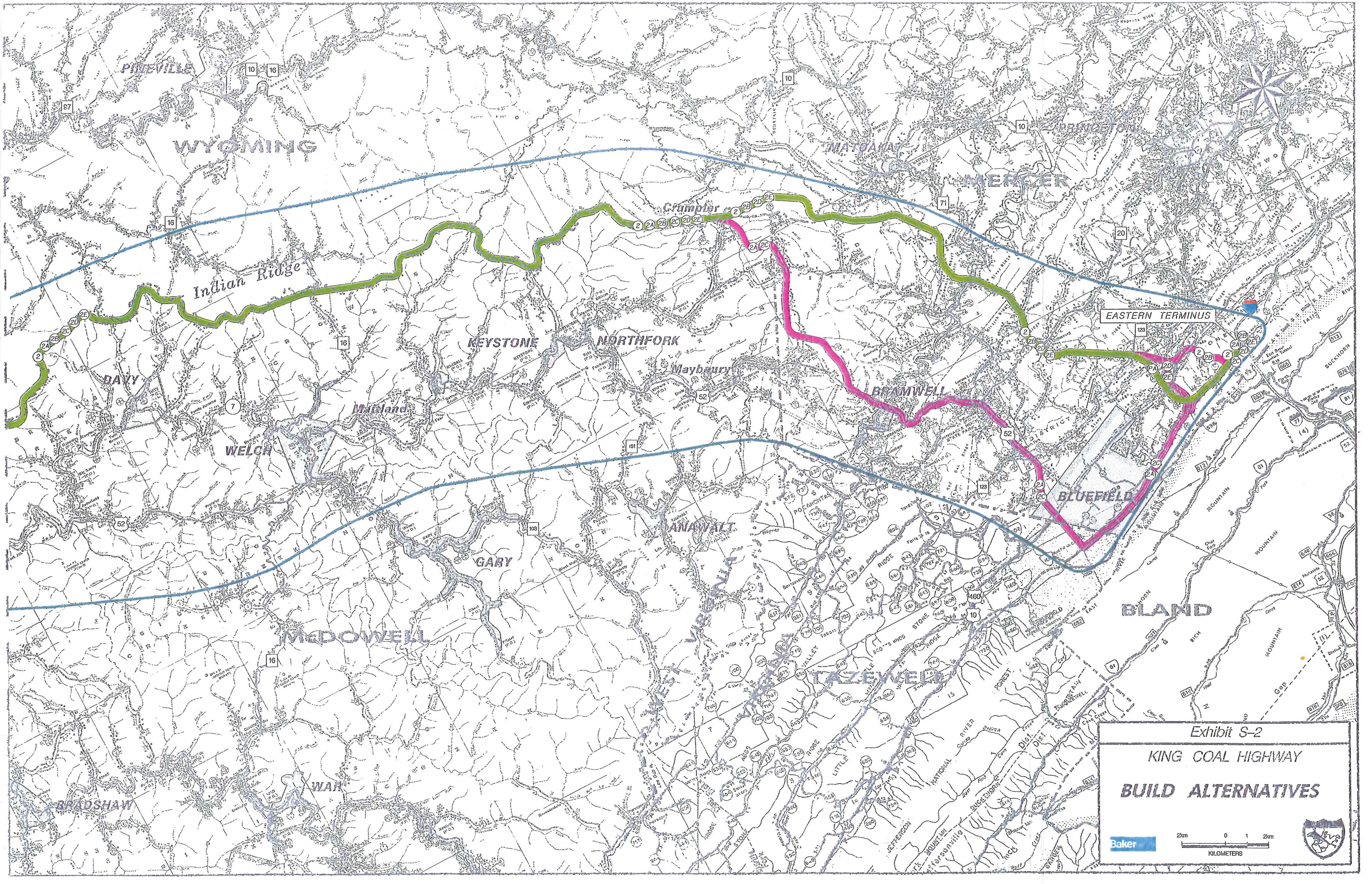


Exhibit S-2

KING COAL HIGHWAY

BUILD ALTERNATIVES

SECTION I: PURPOSE OF AND NEED FOR ACTION

1.1 STUDY AREA DESCRIPTION

The study area for the King Coal Highway involves the West Virginia counties of Mingo, Logan, McDowell, Wyoming, and Mercer; and Tazewell County, Virginia; and is situated in the Appalachian Mountains of southern West Virginia and western Virginia (Exhibit I-1). The terrain is steep and difficult to develop. Most of the area has historically developed around the coal industry. The influence of the coal industry has been so great that it has affected land use, population characteristics, community services, housing development, economy, and transportation opportunities.

Over the last two decades, portions of the study area have experienced a decline in the economy and population due to changes in the coal industry. As a result, the study area has relatively high unemployment and relatively high state and federal income supplements.

1.2 STUDY ROUTE DESCRIPTION

Regional and local traffic traveling between Williamson and Bluefield, West Virginia is currently restricted to using US 52 (study route). The study route (US 52) passes through 35 towns and 6 school zones. These factors result in frequent traffic restrictions due to reduced speed limits, increased pedestrian activity, and increased numbers of turning, parking, and stopped vehicles. In addition to the presence of reduced speed zones, the study route (US 52) is burdened by steep grades, tight curves, and a high percentage of "No Passing Zones". These factors contribute to decreased travel times and high accident rates.

1.3 PURPOSE AND NEED

The *King Coal Highway Purpose and Need Study* (WVDOT, 1994) was prepared in accordance with FHWA's Technical Advisory T6640.8A (USDOT, 1987), *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*, and FHWA's memorandum entitled, *Purpose and Need in Environmental Documents* (USDOT, 1990).

The *King Coal Highway Purpose and Need Study* (WVDOT, 1994) identifies the deficiencies of the study route (US 52) and in turn presents the need for some form of transportation improvement in the study area. By identifying and evaluating the transportation needs in the study area, the purpose of the King Coal Highway project becomes evident. The following is a summary of the project purpose and need detailed in the *Purpose and Need Study* (WVDOT, 1994).

1.3.1 PROJECT PURPOSE

The purpose of the project is to develop transportation improvement solutions that satisfy the study area's transportation needs. The following is a summary of the project purpose:

- Develop a transportation system with minimal geometric constraints (i.e. sharp curves, steep grades, 2-lane "No Passing Zones", narrow lanes/shoulders, bridge restrictions, residential/commercial involvement).
- Minimize the conflict between interstate/intercounty traffic and local traffic.
- Minimize the conflict between truck traffic (i.e. coal trucks) and local traffic, residential areas, and towns.

- Decrease travel times within the study area and between project termini.
- Develop a transportation system that at least operates at Level of Service (LOS) C for both present and projected traffic volumes.
- Minimize/reduce accident rates within the study area, specifically those types of accidents that frequently lead to injury or fatality.
- Reduce emergency response times within the study area for ambulance, police, and fire protection services.
- Develop a transportation system that more safely and efficiently interrelates with the existing railroad system, specifically as it relates to the shipping of coal resources.
- Develop a transportation system that provides safe and efficient access for the many towns and communities within the study area to the regional roadway network such as Interstate 77 (I-77), US 460 (Corridor Q), and US 119 (Corridor G).
- Develop a transportation system that supports and is a part of a broader and more comprehensive economic development plan for the study area by improving access to the local and regional communities and economies.

1.3.2 PROJECT NEED

The FHWA Technical Advisory T6640.8A lists elements which may be important in the establishment of project need. Each of these elements were analyzed in the *King Coal Highway Purpose and Need Study* (WVDOT, 1994). These elements are:

- Current and future capacity and LOS of existing transportation network.
- Current and future transportation demands (regional and local).
- Regional and local system linkage.
- Safety and roadway deficiencies.
- Social demand.
- Economic demand.
- The results of the analyses were presented in detail in the *King Coal Highway Purpose and Need Study* (WVDOT, 1994) and are summarized in the following sections.

1.3.2.1 Capacity and Level of Service

The multi-lane and two-way highway segments along the study route (US 52) as well as major intersecting segments were evaluated by a capacity analysis. Intersecting segments are areas along the study route (US 52) where existing roadways connect. This analysis yielded a Level of Service (LOS). LOS is a standard index of the service provided by a highway facility. LOS can range from 'A' through 'F', where LOS A indicates free flow conditions and LOS F indicates forced flow beyond the capacity of a facility.

The analysis found that for the 1993 peak hour volumes, 67% of the 152 kilometer (95 mile) study route (US 52), and 8 of 14 intersecting segments operated at LOS D or worse.

Year 2013 average daily traffic (ADT) volumes were projected using historical traffic growth trends. This analysis determined the LOS for the No Build Alternative. By the year 2013, approximately 90% of the study route (US 52) and 13 of the 14 intersecting segments on that route would be functioning at LOS D or worse.

1.3.2.2 Transportation Demand

The coal industry and local populace place high transportation demands on the study route (US 52). Because the coal industry is the largest component of the local economy, it is important to provide efficient coal truck passage within and through the study area. US 52 (study route) is the primary route that links Williamson and Bluefield, West Virginia. From 1987 to 1992, the percentage of coal moving out of the area by truck increased by approximately 11%. Approximately 6,000 trucks leave the coal mines in the study area each week. These trucks carry an average of 56% of all coal mined in the study area.

In addition to the regional transportation demand by the coal industry, the study route (US 52) is also the primary access route into the local towns. Demand on the study route (US 52) to provide access to schools, hospitals, and stores has increased as facilities have been centralized. The centralization has occurred in response to the declining population and in attempt to increase facility efficiency.

The local transportation demand and the regional transportation demand are in direct conflict -- regional and through transportation generally requires an efficient thoroughfare; local transportation generally requires multiple access points. The multiple access points along the study route (US 52) cause slower traffic. These demands, along with geometrical constraints, have created a roadway system that is inefficient. This inefficiency is reflected in the LOS analysis summarized above and presented in detail in the *Traffic and Transportation Technical Report* (WVDOT, 1997).

1.3.2.3 System Linkage

National System Linkage

The King Coal Highway is designated in the Intermodal Surface Transportation Efficiency Act (ISTEA) as a high priority segment of a high priority corridor on the National Highway System. The high priority corridor is the I-73/ I-74 Corridor which extends from Charleston, South Carolina northerly to termini in Sault Sainte Marie, Michigan and Davenport, Illinois (Exhibit I-2).

The concept of the I-73/I-74 Corridor is to establish a north-south corridor by linking existing sections of road. Most of the states involved in the I-73/I-74 Corridor have identified specific alignments to be segments of this north-south corridor. The selected alignments are existing four-lane highways or two-lane roadways that will be upgraded to four-lanes. The intention of the I-73/I-74 Corridor is to have a corridor consisting of contiguous four-lane roadway sections developed to interstate standards if possible (WVDOT, 1997).

West Virginia originally identified US 52 as the I-73/74 Corridor through the state. The existing US 52 in West Virginia consists of both four- and two-lane segments. To the north of West Virginia, the corridor will link with US 52 in Ohio. In the south, the corridor splits and connects with two different links in Virginia. Interstate-74 links with I-77 through the East River Mountain Tunnel into Virginia. Interstate-73 links with US 460 (Corridor Q) to Christiansburg, Virginia (WVDOT, 1997).

Regional and Local System Linkage

With the exception of short upgraded sections of US 52 (study route), the current roadway system within the study area consists of two-lane and single-lane, paved, gravel, and dirt roads characterized by geometric constraints such as steep grades and sharp curves. The proposed King Coal Highway will provide a continuous four-lane facility across the region which will be an asset to the regional and local transportation system. The King Coal Highway will provide safe and efficient access to local destinations, as well as, to US 119 to the north near Williamson and to I-77 to the south near Bluefield, West Virginia.

Connection of the King Coal Highway to the interstate highway system is important to the economy of the study area. Currently, the study area is not easily accessible from the interstate highway system or major towns and cities. The King Coal Highway will provide the study area with a connection to US 119 (Appalachian Corridor G), US 460 (Appalachian Corridor Q), I-77, and I-64 (Exhibit I-3). Connection of the study area to these highways will provide efficient access to Indiana, Ohio, Kentucky, Tennessee, North Carolina, Virginia, and Pennsylvania. Interstate access will assist businesses with shipping, improve efficiency of coal transport, and decrease travel times for employees.

The King Coal Highway will also provide improved local access to towns and regional facilities. Residents of small towns along the study route (US 52) will have efficient access to Williamson, Delbarton, Gilbert, Iaeger, Welch, Bramwell, and Bluefield, West Virginia. The regional traffic will decrease on local roads, thus improving local driving conditions. The King Coal Highway will also decrease the isolation of small towns and communities.

Independent Utility

As a separate transportation facility, the King Coal Highway demonstrates independent utility as well as independent significance as required by Federal Highway Administration regulations (23 CFR 771.111(f)). The King Coal Highway will:

- Provide a safe and efficient all-weather facility that will connect regional population centers (Williamson, Delbarton, Gilbert, Iaeger, Davy, Welch, Bramwell, and Bluefield, West Virginia), thus allowing the regional population to access important community facilities (e.g., schools and hospitals) in a safe and timely manner.
- Provide the local populace (low income, unemployed, minorities) with the opportunity to seek employment in neighboring communities (such as Bluefield) that are presently inaccessible due to a deficient transportation system.
- Provide for a decrease in regional traffic on local roads, thereby improving local driving conditions.
- Provide for increased recreational opportunities (Coal Heritage Trail, Pinnacle Rock State Park, R. D. Bailey Lake WMA Horse Creek WMA, Hatfield-McCoy trail system, hunting, and fishing).
- Provide for a system that supports, and is part of a broader, and more comprehensive economic development plan for the study area by improving access to the local and regional communities and economies.

Modal Interrelationships

Other than highways and freight railroads, the only transportation facilities in the region are two small commercial airports and three general aviation airports (Exhibit I-4). There are no port facilities or passenger rail services within the study area. Freight railroads are located throughout the study area. A commercial bus line is located in Bluefield, West Virginia. The two commercial airports served by commuter lines are located in, Bluefield and Beckley, West Virginia. Three general aviation airports are located in Pineville, Welch, and Williamson, West Virginia. Because of the limited modes of other transportation within the area, it is necessary to have efficient highway facilities to transport goods and people into and out of the study area.

1.3.2.4 Safety and Roadway Deficiencies

Existing Roadway Deficiencies

By the year 2013, 90% of the study route (US 52) and 13 of 14 intersecting segments will be functioning at LOS D or worse. The inadequate LOS is due, in part, to the geometric deficiencies of the existing roadways. The study route (US 52) is characterized by steep grades, sharp curves, constant changes in driving conditions, and the presence of many small communities, schools, and "No Passing Zones". All of these factors impede traffic and increase the frequency of accidents.

Accident Rates

As part of the *King Coal Highway Purpose and Need* Study (WVDOT, 1994), accident data were obtained from WVDOT for 1990, 1991, and 1992. From the data, an accident analysis was completed in 1994. This analysis indicated that 35% of the study route (US 52) had accident rates higher than the West Virginia base accident rates; and 86% of the study route (US 52) experienced a higher percentage of accidents involving fatalities and injuries as compared with state-wide percentages.

A comparison of the study area accident types with the statewide accident types revealed that 27% of the study route (US 52) located in West Virginia had at least twice the percentage of head on collisions (63% of the study route located in West Virginia had higher percentages of head on collisions) than the statewide average for similar facilities. While 39% of the study route (US 52) in West Virginia had at least twice the percentage of side swipes involving vehicles traveling in the opposite direction (97% of the study route had higher percentages of side swipes involving vehicles traveling in the opposite direction); and 7% of the study route (US 52) had at least twice the percentage of rear end collisions (68% of the study route had a greater percentage of rear end collisions). The *Manual on Identification, Analysis and Correction of High-Accident Locations* (Missouri Highway and Transportation Department, 1990) lists probable causes for these types of accident (Table I-1).

TABLE I-1
TYPE OF ACCIDENTS AND PROBABLE CAUSES WITHIN THE STUDY AREA

Types of Accidents	Probable Causes
Head On	Roadway design not adequate for traffic conditions (i.e. lanes too narrow, parking along roadside).
Side Swipe - Opposite Direction	Roadway design not adequate for traffic conditions (i.e. lanes too narrow, parking along roadside).
Rear End Collisions	Driver not aware of intersection, pedestrians crossing the roadway, large volume of turning vehicles (i.e. lack of turning lanes).

1.3.2.5 Social and Economic Demand

The study area has developed into an economy dependent on the coal industry for economic growth and employment. Mechanization of the coal industry has led to the decline of employment in that industry. Because of isolation (due primarily to inadequate roadways), the decrease in employment by the coal industry has directly affected the area's economy and population. By increasing regional and local access, the study area could become more socially and economically diverse.

The coal industry relies mainly on trucking services. Increased delays and decreased LOS along the study route (US 52) could raise the expense of trucking coal while reducing the profitability of the coal companies, and inhibiting growth and expansion. The King Coal Highway will decrease travel times and improve the efficiency of coal transportation.

Local officials and regional planners consider employment diversification as a primary means of stimulating the economy. The economic success within the study area is dependent upon the coal industry as well as diversifying employment opportunities.

The current LOS, coal truck usage, and high accident rates along the study route (US 52) are not compatible with economic goals of the area.

Improved access could:

- Allow people living in the study area to work elsewhere.
- Increase business opportunities.
- Keep the cost of trucking coal reasonable.
- Support the development of the tourism industry.

1.4 PURPOSE AND NEED SUMMARY

The *King Coal Highway Purpose and Need Study* (WVDOT, 1994) demonstrated that construction of a new four-lane facility will meet the transportation needs of the study area. Findings of that study are summarized in Table I-2.

TABLE I-2
PURPOSE AND NEED SUMMARY

Factor Contributing to Project Need	King Coal Highway Study Conclusions
Current and Future Capacities and Level of Service (LOS) of Existing Transportation Network	Year 2013 projections reveal 90% of the study route (US 52) will be operating at or below Level of Service (LOS) D. King Coal Highway will improve the LOS and therefore decrease travel times in the study area.
Current and Future Transportation Demands (Regional and Local)	Traffic demand exists to support a 4-lane partially controlled access highway through the study area.
Regional and Local System Linkage	King Coal Highway will enhance both regional and local system linkage, as well as modal interrelationships in the region. This will provide industries and individuals with an efficient route.
Safety and Roadway Deficiencies	Study route has higher than statewide (WV) average accident rates. Roadway deficiencies such as sharp curves and steep grades were identified.
Social Demands	King Coal Highway will improve access for emergency services as well as improve access to community services.
Economic Demands	King Coal Highway will improve access to the study area and could enhance employment and economic development opportunities.
Legislation	The U.S. Congress designated the King Coal Highway, through the ISTEA, as a high priority segment of a high priority corridor on the National Highway System.

Source: USDOT, 1990a.

PURPOSE OF AND NEED FOR ACTION EXHIBITS

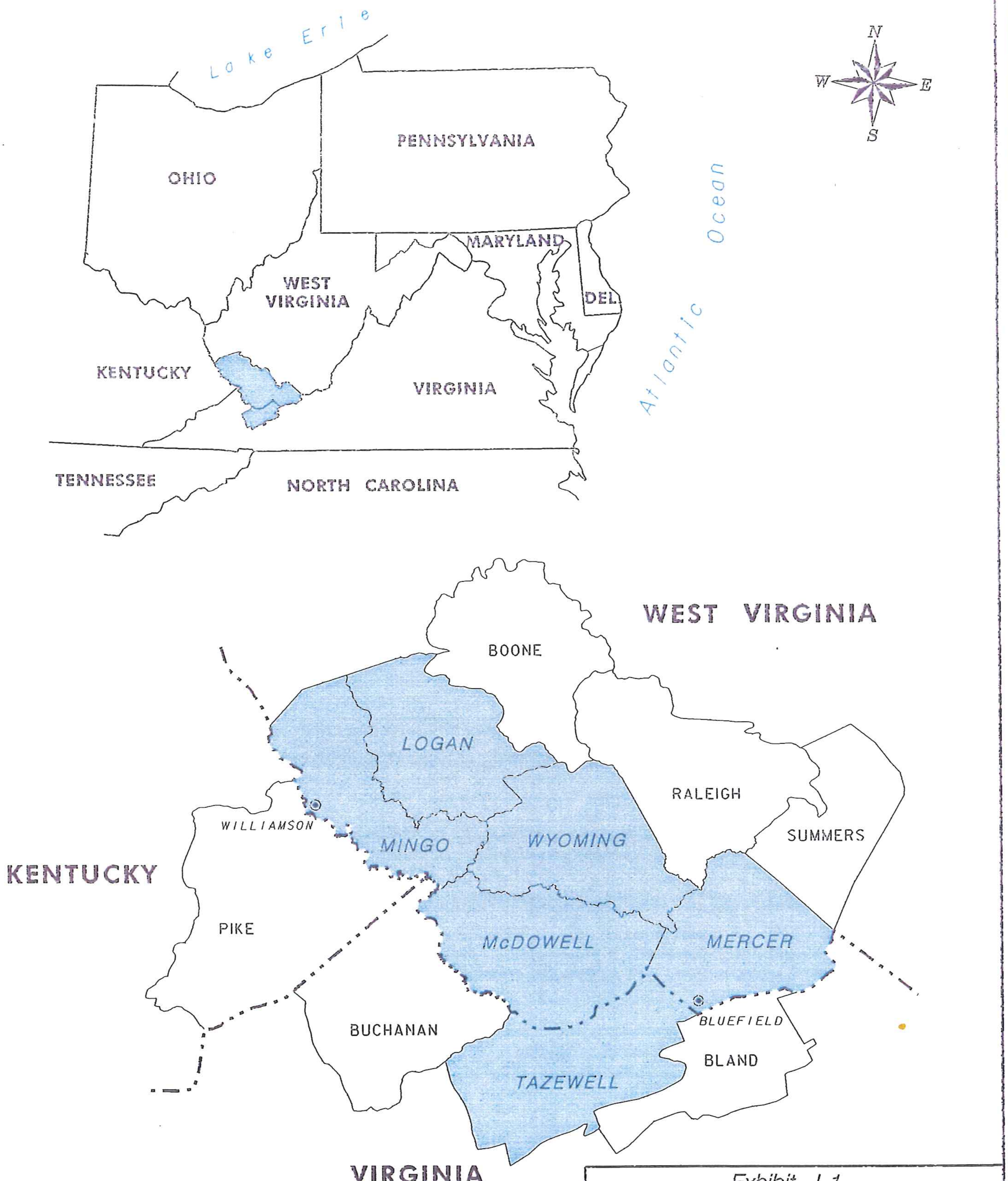


Exhibit I-1

KING COAL HIGHWAY

PROJECT LOCATION

Not to Scale

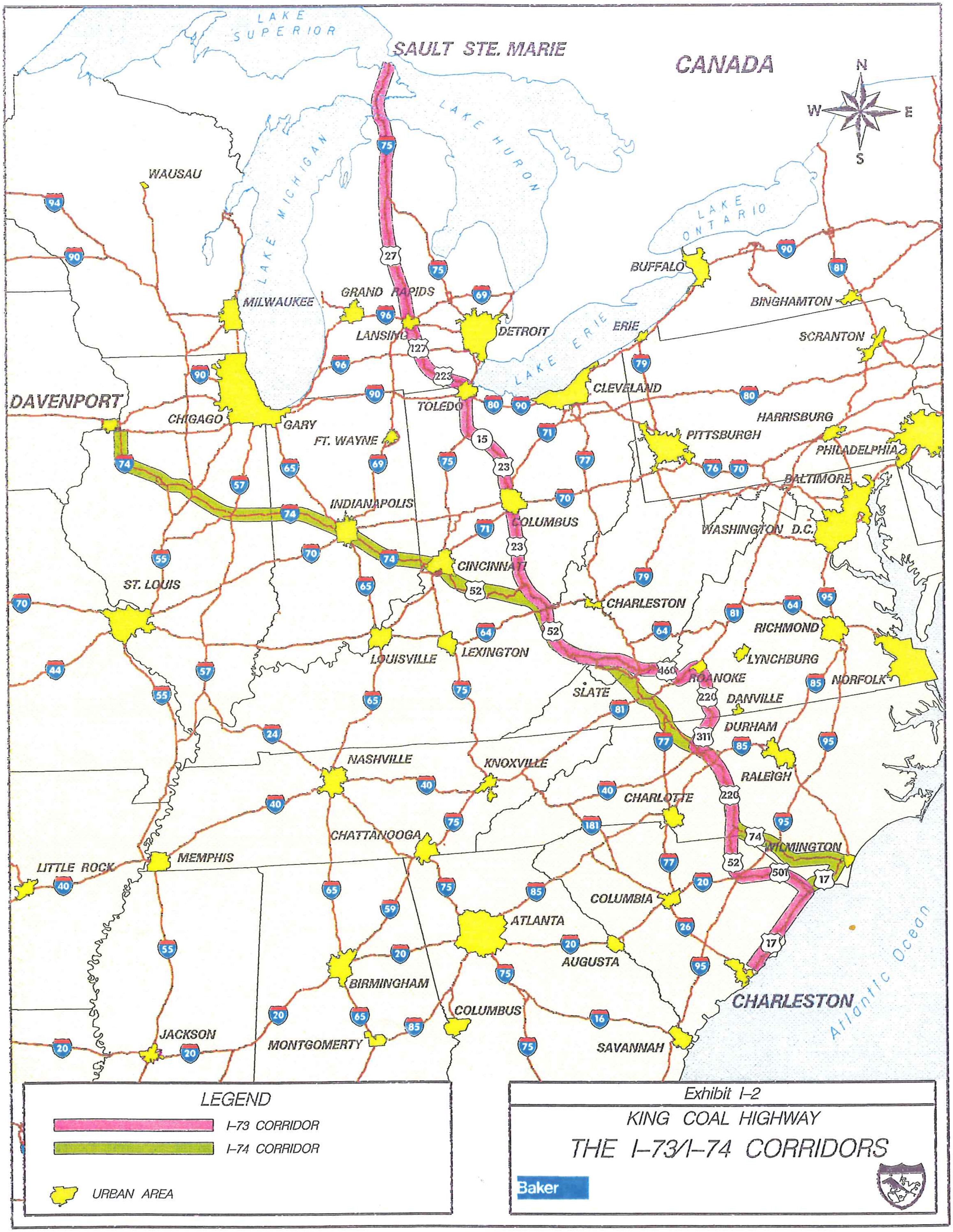


Exhibit I-2

KING COAL HIGHWAY

THE I-73/I-74 CORRIDORS

/y94usr2/shawnee/sdels/kc_els/85bord.dgn 11-AUG-1999 18:09

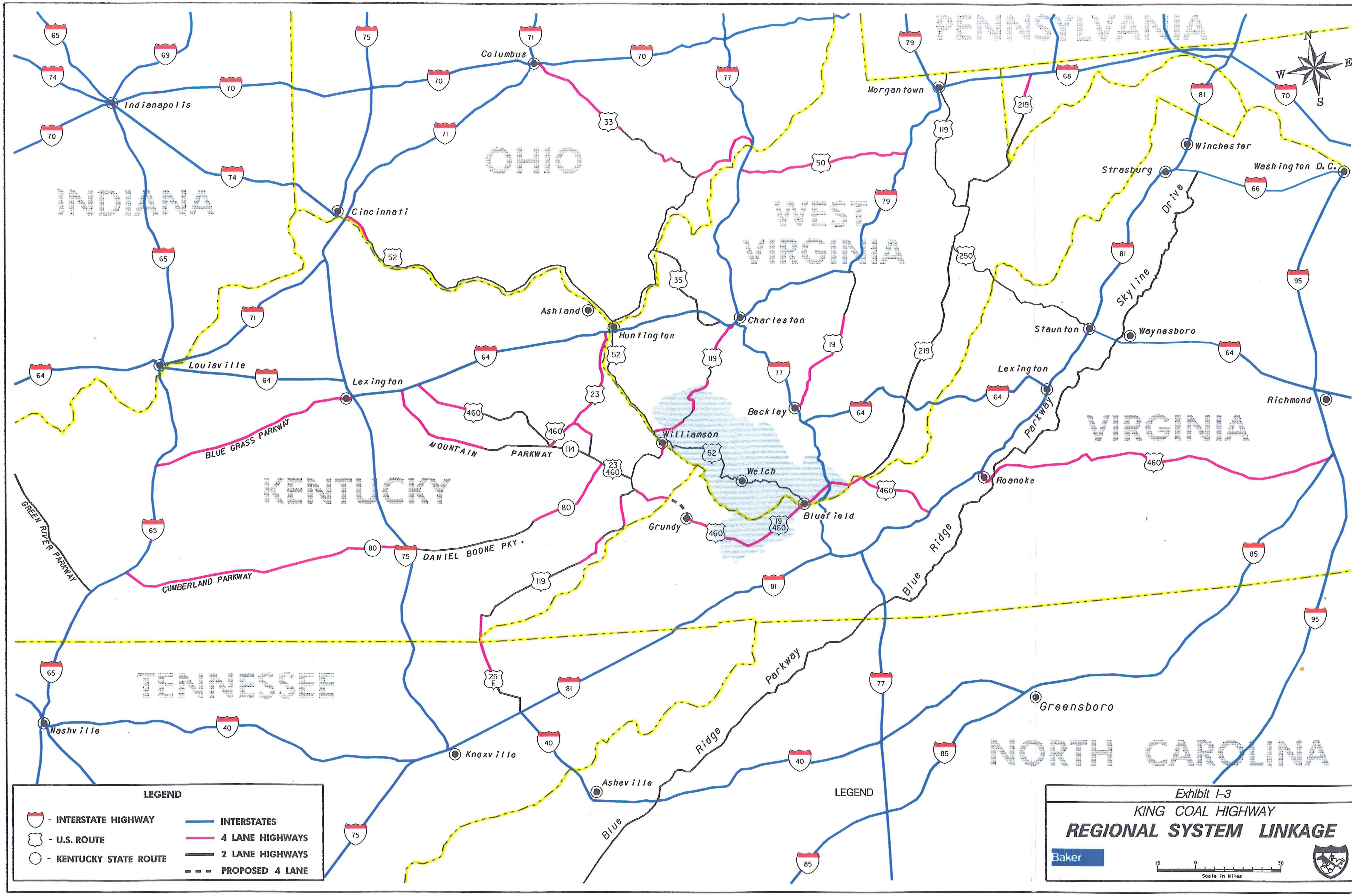


Exhibit I-3
KING COAL HIGHWAY
REGIONAL SYSTEM LINKAGE

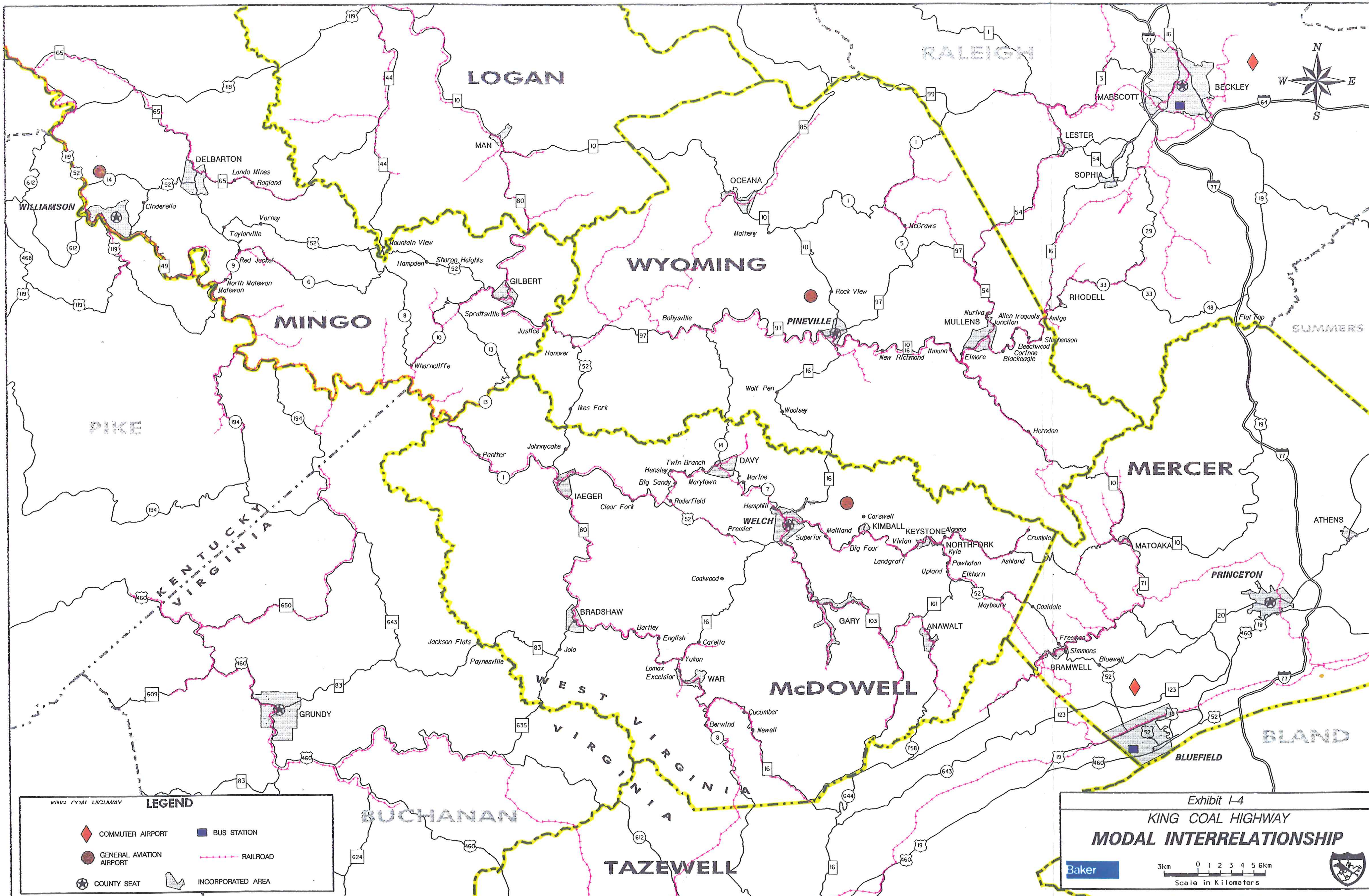


Exhibit I-4
KING COAL HIGHWAY
MODAL INTERRELATIONSHIP

SECTION II: ALTERNATIVES

This section presents the alternatives considered for the King Coal Highway. It includes:

- A discussion of the process through which a broad range of alternatives was developed.
- A description of all alternatives considered.
- Reasons for the elimination of certain alternatives from detailed study.
- Identification and discussion of "reasonable alternatives" carried forward for detailed study.
- Identification of the Preferred Alternative (PA).
- A description of the No Build Alternative.

The Preferred Alternative (PA) was selected on the basis of its' ability to best facilitate the projects Purpose and Need while minimizing impacts to the natural, physical, and social environments. The Build Alternatives identified in this Draft Environmental Impact Statement (DEIS) were all initially considered candidates for the PA. Selection of the PA came after careful consideration and assessment of the potential environmental impacts, (social, natural, and physical), and evaluation of public comments received stemming from public workshops held in May 1998 and February 2000, and public Hearings in March, 2000. Identification of the Preferred Alternative in the DEIS is consistent with Federal Highway Administration (FHWA) and Council of Environmental Quality (CEQ) guidelines and regulations (FHWA Technical Advisory T. 6640.8A; 40 CFR 1502).

2.1 ALTERNATIVES SCREENING PROCESS

A broad range of alternatives was initially identified for the King Coal Highway. The selection of alternatives for study were based on comments received during the project scoping meeting held on September 16, 1993, comments received on the *King Coal Highway Purpose and Need Study* (WVDOT, 1994), and comments received during the Alternatives Study meeting held on May 25, 1995. The project alternatives developed were divided into four broad categories:

- System Wide Improvements (i.e. Transportation System Management and Improved Roadway Alternatives)
- Transit Alternatives (i.e. Mass Transit and Heavy Rail/Freight Transportation)
- Build Alternatives
- No Build Alternative

The alternatives were analyzed in a three step screening process (Exhibit II-1). The alternatives were analyzed to determine if they were able to meet the various components of the project's purpose and need (Table II-1). Those alternatives that were found to meet the purpose and need for the project were carried forward to the second level of analysis.

In the second step of the analysis, potential environmental impacts were assessed for each alternative. Those alternatives that were determined to have the potential for high levels of impacts to the human and natural environments were eliminated from further detailed study.

The third step of this analysis (Level III analysis) involves the selection of the Preferred Alternative (PA) from those alternatives carried forward for further study. Alternatives carried forward, including the No Build Alternative, were examined in the DEIS.

2.2 LEVEL I ALTERNATIVES ANALYSIS - ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Four broad categories of alternatives were investigated. Two of these were eliminated from detailed study due to their failure to meet the transportation needs discussed in *Section I: Purpose and Need For Action*. The two categories eliminated from detailed study are System Wide Improvements and Transit Alternatives. The results of those investigations and the reasons for elimination of these alternatives are presented in the following sections. Elimination of alternatives from detailed study is consistent with 23 CFR 771.123(c).

TABLE II-1
PROJECT ALTERNATIVES PURPOSE AND NEED ANALYSIS

PROJECT NEEDS	ALTERNATIVES CONSIDERED					
	Transportation System Management	Improved Roadway	Mass Transit	Heavy Rail/ Freight Transportation	Build Alternatives	No Build
Decrease travel times within the study area and between termini.	No	No	No	No	Yes	No
Improve operating conditions in the study area.	No	No	No	No	Yes	No
Reduce accident rates in the study area.	No	No	No	No	Yes	No
Improve emergency response times in the study area.	No	No	No	No	Yes	No
Improve system linkage in the study area.	No	No	No	No	Yes	No
Provide safe and efficient access to and through the study area.	No	No	No	No	Yes	No

2.2.1 SYSTEM WIDE IMPROVEMENTS

2.2.1.1 Transportation System Management Alternative

The purpose of the Transportation System Management (TSM) Alternative is to make the existing system as efficient as possible. Typically, the TSM approach includes low-cost improvements such as adding widened shoulders and warning signs; constructing minor realignments of horizontal curves; installing traffic signals; or adjusting the timing of traffic signals. Transportation System Management measures are generally considered appropriate in urban areas where the existing facilities operate beyond the designed capacity limits (USDOT, 1987). Capacity constraints along the study route (US 52) are caused by:

- Current and future traffic volumes.
- The physical constraints of the mountainous terrain.
- Numerous communities along the study route (US 52).

Implementation of TSM measures within the rural study area will not adequately address the purpose of and need for the proposed project. As discussed in the *King Coal Highway Purpose and Need Study* (WVDOT, 1994), 67% of the study route (US 52) and 8 of 14 intersecting segments operated at Level of Service (LOS) D or worse during 1993. By 2013, 90% of the study route and 13 of 14 intersecting segments will be functioning at LOS D or worse. Transportation system constraints that affect the LOS along the study route (US 52) include:

Implementation of TSM measures within the rural study area will not adequately address the purpose of and need for the proposed project. As discussed in the *King Coal Highway Purpose and Need Study* (WVDOT, 1994), 67% of the study route (US 52) and 8 of 14 intersecting segments operated at Level of Service (LOS) D or worse during 1993. By 2013, 90% of the study route and 13 of 14 intersecting segments will be functioning at LOS D or worse. Transportation system constraints that affect the LOS along the study route (US 52) include:

- 132 kilometers (82 miles) of "No Passing Zones" on US 52 (study route).
- 80 advisory speed zones.
- Grades of over 4%, which can slow truck traffic.
- Varying lane widths and shoulder widths.
- The presence of 35 towns along the study route (US 52) which results in frequent restrictions of traffic flow due to increased numbers of turning, parking, and stopped vehicles.
- The presence of 320 substandard curves.
- Transportation System Management improvements (e.g. adding widened shoulders, installing traffic signals) will not alleviate the current transportation system constraints. Therefore, the TSM Alternative will not meet the following needs:
- Decrease travel times within the study area and between the termini.
- Improve the operating conditions (LOS) in the study area.
- Reduce accident rates in the study area.
- Improve emergency response times in the study area.
- Improve system linkage in the study area.
- Provide safe and efficient access to the study area.

Although many of the TSM measures will result in localized traffic safety and operational improvements, the practical need is for a facility that will provide efficient access to and through the region. The need for this access was documented in the *King Coal Highway Purpose and Need Study* (WVDOT, 1994). Because it has been demonstrated that the TSM Alternative will not address these project needs, it has been eliminated from detailed study.

2.2.1.2 Improved Roadway Alternative

The Improved Roadway Alternative (IRA) uses the study route (US 52), with modifications as necessary, to provide at least two 3.6 meter (12 foot) lanes and 1.8 meter (6 foot) shoulders on a horizontal alignment designed to meet the requirements for a design speed of 80 kilometers (50 miles) per hour between Williamson and Bluefield, West Virginia. The first step in evaluating the IRA was to measure and determine the extent of deficiencies where the existing US 52 (study route) does not provide the design speeds and/or roadway widths described above. This process identified four distinct types of roadway segments: adequate segments, segments where relocation will be required, segments that can be upgraded, and segments in developed areas where improvements would not be feasible.

Deficiencies

The study route (US 52) traverses a mountainous area characterized by steep, narrow, winding stream valleys. In many places, the roads were constructed parallel to streams to avoid substantial excavations; however this construction resulted in sharp horizontal curves that do not satisfy modern design standards. For example, the 80 kilometers (50 miles) per hour design speed as called for in American Association of State Highway and Transportation Officials (AASHTO) design policy for a rural arterial highway (AASHTO, 1990) cannot be met by most of the study route (US 52). Sharp curves and steep grades in the roadway were also created when mountains were crossed by winding around the natural shape of the terrain to minimize excavation. Thirty-two kilometers (20 miles) of the 152 kilometers (95 miles) of existing road between Williamson and Bluefield, West Virginia are rated substandard because the curves are too sharp for safe travel at 80 kilometers (50 miles) per hour. Within the 152 kilometers (95 miles) of roadway, there are more than 320 substandard curves.

Table II-2 presents a summary of the study route (US 52) in terms of design speed through developed areas, and the number of substandard curves.

TABLE II-2
STUDY ROUTE (US 52) FROM WILLIAMSON TO I-77

Design Speed	Length	Number of Curves *
< 48 kph (30 mph)	3 km (2 mi)	62
48 to 63 kph (30 to 39 mph)	13 km (8 mi)	136
64 to 79 kph (40 to 49 mph)	16 km (10 mi)	125
> 80 kph (> 50 mph)	106 km (66 mi)	-
Not Determined **	14 km (9 mi)	-
TOTAL	152 km (95 mi)	-

Note: *Number of curves tabulated for substandard portions only.
**Roadway segments through developed areas.
kph = kilometers per hour; mph = miles per hour; km = kilometers; mi = miles

Adequate Segments

In the past 30 years, reconstruction has replaced some of the original winding and steep segments of the study route (US 52) with wide paved lanes, wide shoulders, good horizontal alignment, and more-desirable grades. The IRA will continue the reconstruction efforts by improving substandard segments along the study route (US 52). Table II-3 summarizes the IRA developed for the study route (US 52).

TABLE II-3
IMPROVED ROADWAY ALTERNATIVE

Study Route Improvements	Length kilometers	(miles)
Relocated Segments	60	(37)
Adequate Segments	19	(12)
Upgraded Segments	56	(35)
Developed Segments	14	(9)
TOTAL	149	(93)

Relocated Segments

Improvements to study route (US 52) segments with substandard design speeds (due to sharp curves) will require approximately 60 kilometers (37 miles) of new construction on new alignments (Table II-3). Because the existing road generally follows winding streams and terrain shapes, relocations to eliminate a curve or a series of curves will require some adequate curves and straight sections along current US 52 (study route) to be removed from service. Lengths of the various relocations will be dictated by steep terrain, stream crossings, and developed properties, thereby requiring more mileage than the existing 32 kilometers (20 miles) of substandard road. Alignments for the relocated segments will be developed to minimize, where possible, disruptions to residences and businesses.

Relocations will be constructed to provide two 3.6 meter (12 foot) lanes with 3 meter (10 foot) shoulders. Climbing lanes and left-turn lanes will be provided as required. The relocated segments will require construction of 24 bridges.

Upgraded Segments

Approximately 56 kilometers (35 miles) of existing US 52 (study route), although adequate from a horizontal alignment aspect, will require upgrading (Table II-3). Upgrading will include widening pavement to 3.6 meter (12 foot) lanes, reconstructing shoulders to at least 1.8 meters (6 feet), replacing drainage structures, adding/replacing guardrails, resurfacing existing pavement, and modifying vertical curves where sight distance is inadequate. Two new bridges will be replaced in the upgraded segments as compared to the 24 bridges that will be constructed for the relocated segments of the study route (US 52). In the segments that will be upgraded by minor widening, large numbers of developed properties immediately adjacent to the existing road will be affected.

In the upgraded sections, widening of the roadway will result in steeper grades of many driveways and will require reconstruction of many existing intersections with other roads. Any work on or near the existing road will disrupt traffic. Because there are limited alternate routes, traffic would be delayed; and extra costs will be incurred in the maintenance and protection of the traffic as well as in restricted construction operations encountered by the contractors.

Developed Segments - Constraints

Approximately 14 kilometers (9 miles) of the study route (US 52) are located in developed areas (i.e. Gilbert, Iaeger, Welch, Kimball, Keystone, and Northfork, West Virginia) (Table II-3). Roadway improvements will result in extensive damages to adjacent properties and utilities. Within the communities, residences, businesses, and utilities are in close proximity to the study route (US 52). Most of the buildings are located within four meters (12 feet) of the study route (US 52). Relocation of businesses, residences and utilities will be required, resulting in numerous displacements and community impacts.

In addition to the development constraints, it will not be practical to improve the design speed in developed areas. Speed limits will still be reduced because of development and typical small-town traffic problems. Because of those constraints, no roadway improvements are contemplated in the developed segments.

Safety Considerations

The WVDOT's historical experience with two-lane facilities and truck climbing lanes has not been favorable. Examples of such facilities include Tolsia Highway, portions of Appalachian Corridor L (US 19), and the original West Virginia Turnpike. On all three highways, the overall accident and injury rates are similar to four-lane highways and the interstate system. However, the fatality rate exceeds the Statewide Rural Primary Highway Average (WVDOT, 1990).

The high fatality rate potentially occurs for two reasons. Two-lane roadways do not separate traffic and thus fail to prevent the most severe type of rural collision--head-on collisions. In 1990, the percentage of fatalities resulting from head-on collisions on the Tolsia Highway and US 19 were 60 and 78%, respectively. The high speeds typical of modern rural highways make such accidents severe and more likely to result in death or serious injury (WVDOT, 1990).

The second reason for the high fatality rate involves problems that occur at certain intersections on two-lane, rural highways. Drivers find it difficult to estimate the speed of fast-moving on-coming vehicles, particularly when trying to cross the through highway or to make a left turn onto the highway. In addition, once threshold traffic volumes are reached, at-angle accident problems begin to occur. (At-angle accidents are collisions between vehicles moving in different directions, not opposing directions, usually at a right angle.) Construction of a four-lane facility with medians wide enough to protect most turning vehicles will reduce or eliminate these problems, allowing drivers to be concerned with one through-traffic stream at a time (WVDOT, 1990).

In mountainous terrain, two-lane roadways generally function at a less than acceptable LOS and, as a result, have higher than average accident rates. Drivers can be intolerant of delays caused by trucks and other slower moving vehicles, and therefore engage in risky passing maneuvers. While truck-climbing lanes can be added to accommodate passing needs, they are only partially successful in reducing the average accident rates. The addition of passing lanes leads to other accident-related problems. These problems are associated with passing lanes that end at the top of a grade, especially where climbing lanes may be provided in opposing directions on either side of a mountain (WVDOT, 1990).

System Linkage and Access

Study route (US 52) segment improvements will not address the system linkage deficiency or the need to improve access to the study area communities. Only a consistent, four-lane highway on new location will meet the needs of the study area and provide new linkage to the interstate system. Only a consistent, four-lane highway will provide the access needed to improve traffic operations, safety, freight movements, and living conditions within communities in the central portion of the study area.

Since the IRA requires large numbers of relocations and will not eliminate the safety problems nor the system linkage and access problems indicative of the study area, it has been eliminated from detailed study.

2.2.2 TRANSIT ALTERNATIVES

2.2.2.1 Mass Transit Alternative

A Mass Transit Alternative is relevant only for urbanized areas with a population of over 200,000 (USDOT, 1987). The Federal Transit Administration (FTA) has developed criteria to determine the viability of mass transit projects. Because of interest expressed by cooperating agencies in consideration of the Mass Transit Alternative, the following analysis was conducted using FTA criteria.

Study Area Population

The study area lies within a six-county region with a total 1990 population of approximately 251,934. While this number exceeds the 200,000 minimum, the population is dispersed throughout the six counties, with no single community nearing 200,000. There is some population concentration in small towns, but not enough to support mass transit systems. Populations within the study area ranged from 403 (Davy, West Virginia) to 12,756 (Bluefield, West Virginia) in 1990. No form of inter-community public transportation exists within the study area.

FTA Criteria

The FTA has developed a set of criteria to determine the economic feasibility of developing a new transit system or expanding a current transit system. Each of those criteria and its applicability to the development of the Mass Transit Alternative within the study area are presented in the following discussions.

- **Criterion 1:** The service area must have a high enough population and employment rate to support transit; and a regionally significant Central Business District (CBD) with a mix of housing, office, and retail land uses which would be served by the proposed transit facility.

Studies conducted by the FTA (1993) have determined that public mass transit systems are only economically viable in areas with sufficient population densities and employment rates. FTA's standards are at least 17 dwelling units per hectare (7 dwelling units per acre) for residential development linked to a CBD with an employment base of at least 10,000 and a density of 50 employees per hectare (20 employees per acre).

Population densities in the study area, even in the largest towns (Bluefield, population 12,756) never exceed 2 dwelling units per hectare (1 dwelling unit per acre). Additionally, there is no one significant CBD within the study area. Therefore, the study area does not meet this criterion.

- **Criterion 2:** The region will develop in a compact pattern well suited to travel by transit. There are no current land use plans in the study area that are designed to promote compact development. Interviews with local planners indicate that land use plans do not exist and none are being developed that could be used to guide growth along the study route (US 52).

- **Criterion 3:** There should be policies in place to promote transit, such as limits on parking, growth boundaries, zoning overlays, growth centers, plans to focus growth in the corridor, priority of transit investments over road investments, and mixed-use development. There should be consensus on desirable growth patterns among key local governments and transit investment should be seen as reinforcing a shared vision of growth.

Development plans prepared by the Regional Planning and Development Council (Region I) do not contain transit in their plans. In addition, there are no limits on parking, no adopted or planned growth boundaries, no growth centers, or mixed-use development plans in the study area. Also, local planners emphasize that road investments are a priority in the study area and are promoted over all forms of transportation. Therefore, the study area does not meet this criterion.

In addition to failing the above criteria, the Mass Transit Alternative does not address the following needs identified in the *King Coal Highway Purpose and Need Study* (WVDOT, 1994). The Mass Transit Alternative will not provide the following needs:

- Decreased travel times within the study area and between the termini.
- An efficient route in the region for freight providers and producers.
- Safe and efficient access to the study area.

Because it has been demonstrated that the Mass Transit Alternative is not viable and will not address project needs, it has been eliminated from detailed study.

2.2.2.2 Heavy Rail/Freight Transportation Alternative

The Heavy Rail/Freight Transportation Alternative is composed of two interrelated "sub-alternatives" which are:

- The development of additional rail facilities (e.g. the extension of current rail lines, construction of additional rail spur lines).
- The development of additional truck-rail intermodal transfer facilities along the study route (US 52) between Williamson and Bluefield, West Virginia.

Under the Heavy Rail/Freight Transportation Alternative the theoretical goal is to reduce the truck traffic in the study area. The development purpose of these additional facilities is to remove heavy trucks, particularly coal trucks, from the study route (US 52). In theory, the removal of these trucks could increase the efficiency of the current transportation system and reduce the need for new highway construction. In reality, traffic counts conducted by the WVDOT in 1993 show that trucks account for between 7 and 10% of the average daily traffic (ADT) along the study route (US 52). The primary factors that affect the operating conditions (LOS) of the study route (US 52) are the "No Passing Zones", steep grades, sharp curves, and lane widths.

Development of Additional Rail Facilities

As identified in the *King Coal Highway Purpose and Need Study* (WVDOT, 1994), there are over 7.6 billion tons of coal reserves in the study area counties. Therefore, coal production within the area will continue for the foreseeable future. Data from the West Virginia Coal Association (1993) show that approximately 40% of the coal currently mined in the study area is transported by trucks. Recent coal production in the study area counties exceeded 57 million tons, of which 36 million tons were from underground mines and 21 million tons were from surface mines (West Virginia Bureau of Mining, 1996). However, production has decreased by almost 20% in McDowell and Wyoming counties since 1990, while increasing by almost 15% in Logan and Mingo counties. Mercer County production has also fluctuated, but produces a much lower portion of the coal produced in the study area than the other counties. In addition, total coal production in the state decreased between 1990 and 1995, even though low-sulfur coal typical throughout southern West Virginia counties is more desirable for metallurgical and utility markets due to the restrictions on sulfur emissions under the Clean Air Act Amendments of 1990 (West Virginia Coal Association, 1993).

The rail lines in the study area are owned by Norfolk Southern Corporation (Norfolk Southern) and CSX Transportation, Inc. (CSX). Coal is the predominant commodity carried by these railroads. Service provided by rail lines is described in terms of density. Density is defined as annual million gross tons of transported freight. Exhibit II-2 shows the density of rail lines in the study area. The rail line with the highest density of freight transportation in the study area is owned by Norfolk Southern (Exhibit II-2). This line begins in Tazewell County, Virginia, runs through parts of western Mercer County, and then parallels the Tug Fork and the study route (US 52) through McDowell County. The line remains along the Tug Fork through Mingo County to the western end of study area and ultimately to Kenova in Wayne County. The density along this line ranged between 77.6 and 98.2 million gross tons of freight per year in 1991, some of the highest in the state (West Virginia Railroad Maintenance Authority, 1994). There are connections and numerous spurs along this rail line, particularly in McDowell and Mingo counties.

Norfolk Southern has another line that parallels the northern boundary of the study area. This rail line travels along the Guyandotte River in Wyoming County and connects to the mainline east of the study area in Mercer County. The density along this line is between 6.2 and 12.2 million gross tons of freight per year (Exhibit II-2). This line and its spurs and the Tug Fork line and its spurs comprise most of the Pocahontas Division of Norfolk Southern (generally, McDowell, Mercer, Mingo, Raleigh, and Wyoming counties) which carries 120-140 trains per day (West Virginia Railroad Maintenance Authority, 1994). The CSX line with the highest density of freight transportation close to the study area is located primarily along the New and Kanawha rivers and has several spurs extending into the study area in Mingo County (Exhibit II-2).

Currently the trend in rail access is to condense rail traffic to several main high-density lines. Unused and light density (less than one million gross tons per year) lines are being abandoned by the rail companies. Service is not being expanded through additional spurs or connections to mines. This limited service is justified by the leveling off in coal production.

The trend of condensing rail traffic to high-density lines is apparent in Norfolk Southern's recent project. Norfolk Southern is undertaking a project to increase the height of tunnels throughout southern West Virginia to enable double-stacked intermodal trains to travel along lines with low existing tunnels. Until this is completed, trains are traveling through Knoxville, Tennessee in order to connect to lines on the East Coast. When this project is complete, train traffic along the lines in southern West Virginia would most likely increase (Hedrick, 1996). Therefore, the development of additional rail facilities (e.g., the extension of current rail lines, construction of spur lines) is not consistent with the current rail access trend. The trend is to eliminate low-density lines and to condense rail traffic to high-density main lines.

To remove coal-related truck traffic from the roadway network, rail facilities will have to access approximately 200 mines. The mine facilities are scattered throughout the 1341 square kilometer (518 square mile) study area and use the roadway system to access rail lines or other destinations. Numerous rail lines or spurs will have to be constructed so that the rail lines could provide the same access as the current roadway network. Current coal trips that use the study route (US 52) include trips from coalmines to rail yards. Also, there are truck trips from mines to coal processing facilities. The study route (US 52) also supports truck movements from study area coal mines to a number of barge loading facilities near Huntington, West Virginia, north of Williamson, West Virginia on US 52. Study area coal companies use the study route (US 52) for trips from the mines to Charleston, Beckley, and Princeton, West Virginia. In order for rail to remove coal trucks from the study route (US 52) and local roads, it will have to provide access to all of these destinations and require a change in the coal transportation network currently in place.

There are constraints to providing additional rail facilities to the mines in the study area. First, the rail lines are privately owned. The construction of additional rail lines will have to be provided through the private companies and not through the WVDOT and the public sector. Second, the origins and destinations for some of the coal truck trips are shorter-distance trips that are more effectively served by the current roadway network and study route (US 52). The roadway system, because of the interconnections of the network, provides more flexibility and access to and from coalmines than the rail alternative. Third, the geographic dispersion of the mines means that many new rail spurs will have to be added. This increases the private investment needed to complete the rail additions. Fourth, additional rail spurs will have to be added as coal seams are mined in new locations.

Finally, because an expanded rail line will have a smaller "footprint" on the land in a valley, it may have less displacements, floodplain and wetland encroachments, and historic and archaeological impacts, than a highway in the valleys (Alternatives 1 through 1G). However, a rail line in the valleys may have similar, if not greater, impacts on noise and air quality as a highway. In addition, a rail alternative in the valleys will have more social and environmental impacts than a highway alternative along the ridge tops (Alternatives 2 through 2E) due to development patterns in the study area.

Development has mainly occurred in the valleys due to the availability of flat terrain and the existing roadway network.

In addition to the constraints discussed above, the provision of additional rail facilities does not address the needs for the King Coal Highway identified in the *Purpose and Need Study* (WVDOT, 1994). The provision of additional rail facilities will not:

- Decrease travel times within the study area and between the termini caused by roadway deficiencies.
- Improve the operating conditions (LOS) in the study area that are most sensitive to "No Passing Zones", steep grades, sharp curves, and lane widths.
- Reduce accident rates in the study area that occur due to roadway deficiencies.
- Improve emergency response times in the study area.
- Improve system linkage in the study area for through travelers.
- Add new safe and efficient access in the study area.

The addition of new rail facilities will not improve current transportation system constraints. There would be no improvements to the roadway network to reduce grades, improve curvature, or provide additional passing lanes along the study route (US 52). In addition, because roadway geometrics will not be improved, the capacity constraints that result from narrow lanes, lack of passing lanes, and sharp curves will remain.

Development of Additional Truck-Rail Intermodal Transfer Facilities

According to traffic counts conducted by the WVDOT in 1993, trucks account for between 7 and 10% of the average daily traffic (ADT) along the study route (US 52). Average daily traffic along the study route (US 52) varies from a high of 32,500 in Mercer County to a low of 3,400 in sections of Wyoming County for the year 2013. Under the Heavy Rail/Freight Transportation Alternative, the goal is to reduce the truck traffic in the study area. The provision of additional truck-rail facilities within the study area, such as in Welch, Gilbert, or Iaeger, West Virginia will not eliminate truck traffic. Local trips to the transfer facilities and short-distance hauls will still rely on the study route (US 52).

The addition of truck-rail facilities will not improve the transportation system constraints as identified in the *King Coal Highway Purpose and Need Study* (WVDOT, 1994). The development of additional truck-rail intermodal transfer facilities will not:

- Decrease travel times within the study area and between the termini caused by roadway deficiencies.
- Improve the operating conditions (LOS) in the study area.
- Reduce accident rates in the study area that occur due to roadway deficiencies.
- Improve emergency response times in the study area.
- Improve system linkage in the study area for through travelers.
- Add new safe and efficient access in the study area.

There will be no improvements to the roadway network to reduce grades, improve curvature, or provide additional passing lanes in the study area. Due to the mountainous terrain of the study area traffic delays will continue, unless all trucks were removed from the current system. The capacity constraints that result from narrow lanes, lack of passing lanes, and sharp curves will remain because roadway geometrics will not be improved.

Because it has been demonstrated that the Heavy Rail/Freight Transportation Alternative is not viable and will not address project needs, it has been eliminated from detailed study.

2.3 LEVEL II ALTERNATIVES ANALYSIS - ALTERNATIVES CONSIDERED FOR FURTHER STUDY

The project needs as identified in the *King Coal Highway Purpose and Need Study* (WVDOT, 1994) can be grouped into four general transportation needs:

- Improved regional transportation between Williamson and Bluefield, West Virginia.
- Improved local transportation.
- Decreased travel times.
- Safer traveling conditions.

The three-step alternatives analysis determined that the only alternatives which meet all of the transportation needs are the Build Alternatives (Table II-1).

2.3.1 NO BUILD ALTERNATIVE

Although the No Build Alternative was found not to meet the needs of the study area, it is retained as a basis for comparison with the various Build Alternatives as required by CEQ regulations (40 CFR 1502.14(d)).

The No Build Alternative consists of a continuation of the existing routes between Williamson and Bluefield, West Virginia. This alternative includes short-term, minor restoration activities such as resurfacing, bridge repairs, and minor widening. These improvements are already a part of the ongoing plan for the continued operation of the existing roadway system.

The existing roadway network is deficient in several ways (safety, travel times, linkage). Motorists will continue to experience inadequate regional and local service as they travel along the study route (US 52). By 2013, 90% of the study route and 13 of 14 intersecting segments will be operating at LOS D or worse.

2.3.2 BUILD ALTERNATIVES CONSIDERED

During the initial stages of this project, a 5 to 8 kilometer (3 to 5 mile) wide study area was developed for the King Coal Highway. Within the study area, 12 Build Alternatives approximately 300 meters (984 feet) wide and averaging 183 kilometers (114 miles) in length were developed. Each of the 12 Build Alternatives extends from the vicinity of Williamson, West Virginia to the vicinity of Bluefield, West Virginia. The Build Alternatives were planned as four-lane, divided, partially controlled access facilities.

In the second level of the alternatives analysis, potential environmental impacts were assessed for each Build Alternative through secondary sources of data and confirmed by field investigations. The assessment examined potential direct, secondary, and cumulative impacts to the human and natural environments that could occur from construction of a new highway.

As a result of the analysis, 8 of the 12 Build Alternatives were eliminated from further detailed study due to their extensive potential impacts to natural, cultural and socio-economic resources of the study area and extensive community effects. The Build Alternatives eliminated from further study included 1, 1A, 1B, 1C, 1D, 1E, 1F, and 1G. A detailed discussion of the alternatives analysis is contained in the *King Coal Reduction of Build Alternatives Report* (January 1997). The results of that analysis were presented to the resource agencies on January 29, 1997, as required by the Integrated NEPA/404 process.

The 6 Build Alternatives (2 additional alignments were developed in 1997) retained for detailed study included Alternative 2, 2A, 2B, and 2C, 2D, and 2E. The potential environmental consequences associated with each of the 6 Build Alternatives are summarized in Table S-2.

2.4 LEVEL III ALTERNATIVES ANALYSIS - ALTERNATIVES CONSIDERED FOR DETAILED STUDY

Alternatives considered for detailed study include the No Build Alternative and Alternatives 2, 2A, 2B, 2C, 2D, and 2E (Exhibit II-3). Alternatives 2D and 2E were developed in 1997 to further reduce environmental impacts resulting from the proposed highway. These six Build Alternatives have the least amount of impacts to the human and natural environments of all the Build Alternatives considered for the King Coal Highway and satisfy the project purpose and need.

2.4.1 Alternative 2

Alternative 2 is approximately 149 kilometers (93 miles) in length. It begins in Mingo County at the intersection of US 52 and US 119 north of Williamson, West Virginia. Alternative 2 follows US 52 southeasterly to Goodman where it crosses US 52 and proceeds east paralleling Sugartree Creek to the summit adjacent to the Mingo County Airport. It passes through the gap north of Sycamore Creek and crosses US 52 proceeding easterly. Near Delbarton, Alternative 2 turns southeasterly and generally parallels US 52 which is located north of the alternative. Alternative 2 crosses over Mingo County Route 9 and ascends to the ridge top which it follows easterly for approximately 40 kilometers (25 miles). As the alternative passes to the south of Coon Knob, Hampden, and Sharon Heights, it turns south and crosses Mingo County Route 10 near Twisted Gun Gap.

Alternative 2 continues southeasterly and then easterly, following the ridge line over the Mingo/McDowell and McDowell/Wyoming County lines. The alternative follows Indian Ridge, which is also the Wyoming/McDowell County line, eastward to Crumpler. Near Crumpler, it passes over Flat Top Mountain and parallels Pinnacle Creek. Proceeding southeasterly, it crosses Pinnacle Creek, Mercer County Route 11, Lambert Browning Mountain, and Bluestone River.

East of the Bluestone River, Alternative 2 parallels Sandlick Creek and traverses the summit of Micajah Ridge. The alternative continues easterly, crossing WV 20, Mercer County Routes 23 and 36, WV 123, US 19, and US 460. It passes through Stony Gap and veers northeasterly around Stony Ridge. Crossing WV 112 and the East River, the alternative connects to US 52 less than 1.6 kilometers (1.0 mile) south of the US 52/I-77 Interchange. Alternative 2 follows US 52 to its terminus at the US 52/I-77 Interchange.

2.4.2 Alternative 2A

Alternative 2A is approximately 159 kilometers (99 miles) in length. It begins in Mingo County at the intersection of US 52 and US 119 north of Williamson, West Virginia. Alternative 2A follows US 52 southeasterly to Goodman where it crosses US 52 and proceeds east paralleling Sugartree Creek to the summit adjacent to the Mingo County Airport. It passes through the gap north of Sycamore Creek and crosses US 52 proceeding easterly. Near Delbarton, Alternative 2A turns southeasterly and generally parallels US 52 which is located north of the alternative. Alternative 2A crosses over Mingo

County Route 9 and ascends to the ridge top which it follows easterly for approximately 40 kilometers (25 miles). As the alternative passes to the south of Coon Knob and Hampden and Sharon Heights, it turns south and crosses Mingo County Route 10 near Twisted Gun Gap.

Alternative 2A continues southeasterly and then easterly, following the ridge line over the Mingo/McDowell and McDowell/Wyoming County lines. The alternative follows Indian Ridge, which is also the Wyoming/McDowell County line, eastward to Crumpler. North of Crumpler, Alternative 2A leaves Indian Ridge, skirts around Flat Top Mountain, and turns south continuing to US 52. Between Coaldale and Freeman, Alternative 2A joins US 52 and follows the path of US 52 to WV 123. East of WV 123, the route turns south and continues cross-country. The alternative passes over the intersection of US 19 and Mercer County 11 and continues across the Mercer/Tazewell County line into Virginia where it connects to US 460. Alternative 2A follows US 460 northeasterly to US 52. Connecting to US 52, the alternative follows this route to its terminus at the US 52/I-77 Interchange.

2.4.3 Alternative 2B

Alternative 2B is approximately 149 kilometers (93 miles) in length. It begins in Mingo County at the intersection of US 52 and US 119 north of Williamson, West Virginia. Alternative 2B follows US 119 northeasterly to approximately 1.6 kilometers (1.0 mile) east of the WV 65 intersection near Belo. At this location, Alternative 2B proceeds south and then east crossing Buffalo Mountain and US 52. It proceeds easterly and passes to the south of Delbarton. Near Delbarton, Alternative 2B turns southeasterly and generally parallels US 52 which is located north of the alternative. Alternative 2B crosses over Mingo County Route 9 and ascends to the ridge top which it follows easterly for approximately 40 kilometers (25 miles). As the alternative passes to the south of Coon Knob, Hampden, and Sharon Heights, it turns south and crosses Mingo County Route 10 near Twisted Gun Gap.

Alternative 2B continues southeasterly and then easterly, following the ridge line over the Mingo/McDowell and McDowell/Wyoming County lines. The alternative follows Indian Ridge, which is also the Wyoming/McDowell County line, eastward to Crumpler. Near Crumpler, it passes over Flat Top Mountain and parallels Pinnacle Creek. It crosses Pinnacle Creek, Mercer County Route 11, Lambert Browning Mountain, and Bluestone River.

East of the Bluestone River, Alternative 2B parallels Sandlick Creek and traverses the summit of Micajah Ridge. The alternative continues easterly, crossing WV 20, Mercer County Routes 23 and 36, WV 123, US 19, and US 460. It passes through Stony Gap and veers northeasterly around Stony Ridge.

Crossing WV 112 and the East River, the alternative connects to US 52, less than 1.6 kilometers (1.0 mile) south of the US 52/I-77 Interchange. Alternative 2B follows US 52 to its terminus at the US 52/I-77 Interchange.

2.4.4 Alternative 2C

Alternative 2C is approximately 159 kilometers (99 miles) in length. It begins in Mingo County at the intersection of US 52 and US 119 north of Williamson, West Virginia. Alternative 2C follows US 119 northeasterly to approximately 1.6

kilometers (1.0 mile) east of the WV 65 intersection near Belo. At this location, Alternative 2C proceeds south and then east crossing Buffalo Mountain and US 52. It proceeds easterly and passes to the south of Delbarton. Near Delbarton, Alternative 2C turns southeasterly and generally parallels US 52 which is located north of the alternative. Alternative 2C crosses over Mingo County Route 9 and ascends to the ridge top which it follows easterly for approximately 40 kilometers (25 miles). As the alternative passes to the south of Coon Knob, Hampden, and Sharon Heights, it turns south and crosses Mingo County Route 10 near Twisted Gun Gap.

Alternative 2C continues southeasterly and then easterly, following the ridge line over the Mingo/McDowell and McDowell/Wyoming County lines. The alternative follows Indian Ridge, which is also the Wyoming/McDowell County line, eastward to Crumpler. North of Crumpler, Alternative 2C leaves Indian Ridge, skirts around Flat Top Mountain, and turns south continuing to US 52. Between Coaldale and Freeman, Alternative 2C joins US 52 and follows the path of US 52 to WV 123. East of WV 123, the route turns south and continues cross-country. The alternative passes over the intersection of US 19 and Mercer County 11 and continues across the Mercer/Tazewell County line into Virginia where it connects to US 460. Alternative 2C follows US 460 northeasterly to US 52. Connecting to US 52, the alternative follows this route to its terminus at the US 52/I-77 Interchange.

2.4.5 Alternative 2D

Alternative 2D is approximately 152 kilometers (95 miles) in length. It begins in Mingo County at the intersection of US 52 and US 119 north of Williamson, West Virginia. Alternative 2D follows US 52 southeasterly to Goodman where it crosses US 52 and proceeds east paralleling Sugartree Creek to the summit adjacent to the Mingo County Airport. It passes through the gap north of Sycamore Creek and crosses US 52 proceeding easterly. Near Delbarton, Alternative 2D turns southeasterly and generally parallels US 52 which is located north of the alternative. Alternative 2D then crosses over Mingo County Route 9 and ascends to the ridge top which it follows easterly for approximately 40 kilometers (25 miles). As the alternative passes to the south of Coon Knob, Hampden, and Sharon Heights, it turns south and crosses Mingo County Route 10 near Twisted Gun Gap.

Alternative 2D continues southeasterly and then easterly, following the ridge line over the Mingo/McDowell and McDowell/Wyoming County lines. The alternative follows Indian Ridge, which is also the Wyoming/McDowell County line, eastward to Crumpler. Near Crumpler, it passes over Flat Top Mountain and parallels Pinnacle Creek. Proceeding southeasterly, it crosses Pinnacle Creek, Mercer County Route 11, Lambert Browning Mountain, and Bluestone River.

East of the Bluestone River, Alternative 2D parallels Sandlick Creek and traverses the summit of Micajah Ridge. The alternative continues easterly, crossing WV 20, Mercer County Routes 23 and 36, and WV 123. At Stony Gap, Alternative 2D veers south following US 19 and US 460 to the intersection with US 52. It then follows US 52 northeasterly to its terminus at the US 52/I-77 Interchange.

2.4.6 Alternative 2E

Alternative 2E is approximately 151 kilometers (94 miles) in length. It begins in Mingo County at the intersection of US 52 and US 119 north of Williamson, West Virginia. Alternative 2E follows US 119 northeasterly to approximately 1.6 kilometers (1.0 mile) east of the WV 65 intersection near Belo. At this location, Alternative 2E proceeds south and then east crossing Buffalo Mountain and US 52. It proceeds easterly and passes to the south of Delbarton. Near Delbarton, Alternative 2E turns southeasterly and generally parallels US 52 which is located north of the alternative. Alternative 2E crosses over Mingo County Route 9 and ascends to the ridge top which it follows easterly for approximately 40 kilometers (25 miles). As the alternative passes to the south of Coon Knob, Hampden, and Sharon Heights, it turns south and crosses Mingo County Route 10 near Twisted Gun Gap.

Alternative 2E continues southeasterly and then easterly, following the ridge line over the Mingo/McDowell and McDowell/Wyoming County lines. The alternative follows Indian Ridge, which is also the Wyoming/McDowell County line, eastward to Crumpler. Near Crumpler, it passes over Flat Top Mountain and parallels Pinnacle Creek. It crosses Pinnacle Creek, Mercer County Route 11, Lambert Browning Mountain, and Bluestone River.

East of the Bluestone River, Alternative 2E parallels Sandlick Creek and traverses the summit of Micajah Ridge. The alternative continues easterly, crossing WV 20, Mercer County Routes 23 and 36, and WV 123. At Stony Gap, Alternative 2E veers south following US 19 and US 460 to the intersection with US 52. Alternative 2E follows US 52 northeasterly to its terminus at the US 52/I-77 Interchange.

2.4.7 Preferred Alternative

The Preferred Alternative (PA) is approximately 151 kilometers (94 miles) in length. It begins in Mingo County at the intersection of US 52 and US 119 north of Williamson, West Virginia. The PA follows US 119 northeasterly to approximately 1.6 kilometers (1.0 mile) east of the WV 65 intersection near Belo. At this location, the PA proceeds south and then east crossing Buffalo Mountain and US 52. It proceeds easterly and passes to the south of Delbarton. Near Delbarton, the PA turns southeasterly and generally parallels US 52 which is located north of the alternative. The PA crosses over Mingo County Route 9 and ascends to the ridge top which it follows easterly for approximately 40 kilometers (25 miles). As the PA passes to the south of Coon Knob, Hampden, and Sharon Heights, it turns south and crosses Mingo County Route 10 near Twisted Gun Gap.

The PA continues southeasterly and then easterly, following the ridge line over the Mingo/McDowell and McDowell/Wyoming County lines. The alternative follows Indian Ridge, which is also the Wyoming/McDowell County line, eastward to Crumpler. Near Crumpler, it passes over Flat Top Mountain and parallels Pinnacle Creek. It crosses Pinnacle Creek, Mercer County Route 11, Lambert Browning Mountain, and Bluestone River.

East of the Bluestone River, The PA parallels Sandlick Creek and traverses the summit of Micajah Ridge. The PA continues easterly, crossing WV 20, Mercer County Routes 23 and 36. Atop of Hurricane Ridge, the PA then veers south, crossing WV 123. The PA then traverses Stony Ridge in a southerly direction where it crosses US 19 and US 460 to the intersection with US 52. The PA then follows US 52 northeasterly to its terminus at the US 52/I-77 Interchange.

2.4.8 Preferred Alternative – Williamson Connector

The PA also includes a connector road (proposed 4-lane limited access highway) to facilitate efficient access to Williamson to and from the PA. The connector will also provide access to the Mingo County Airport. The Williamson Connector is approximately 8 kilometers (4.9 miles) in length. It begins in Mingo County at Goodman along US 52. The Connector proceeds in an easterly direction, paralleling Sugartree Creek to the summit adjacent to the Mingo County Airport. It then passes through the gap north of Sycamore Creek and crosses US 52. The Williamson Connector then proceeds easterly towards Delbarton, where it intersects with the PA.

2.5 DESIGN CRITERIA

The King Coal Highway will be designed as a four-lane, divided, partially controlled access arterial that will result in a facility similar to the Appalachian Development Highways such as Corridors D, G, and Q. The Williamson Connector will also be designed as a four-lane, divided, partially controlled access arterial. A design speed of 110 kph (65 mph) will be used to determine the horizontal and vertical alignments (Table II-4) for the King Coal Highway. All other design criteria not listed in Table II-4 will be in accordance with the currently approved AASHTO *Policy on Geometric Design of Highways and Streets.*

The Build Alternatives provide for two lanes of travel in each direction separated by a depressed median 14 meters (46 feet) or more in width or by a 4.8 meter (16 foot) wide median with a concrete barrier in the center (Exhibit II-4). Truck climbing lanes will be provided where warranted.

TABLE II-4
DESIGN CRITERIA

Design Element	Criteria
Design Speed	100 kph (65 mph)
Minimum Radius of Curve	395 m (1528 ft)
Maximum Grade	5.5%
Minimum Stopping Sight Distance	205 m (750 ft)

Source: AASHTO, 1994.
Note: kph = kilometers per hour; mph = miles per hour; m = meter; ft = feet

Access to the highway will be limited to designated points such as intersections and/or interchanges with public roads and at other locations for direct access to abutting property. The number of access points will generally be limited to two per side per 1.6 kilometers (1.0 mile).

A minimum curve radius of 395 meters (3 degrees, 45 minutes maximum degree of curve) and a maximum gradient of 5.5% will be used for the mainline sections. Secondary connector roads will generally have a maximum grade of 7%. Because the proposed King Coal Highway is intended to carry through and long trip traffic, minimizing delay on the mainline will be a high priority. Even though this will not be an interstate highway, the use of grade separations and interchanges for junctions may be used.

Interchanges and grade separations are warrants. There are six warrants that rationalize the decision process. The first warrant, *design* *designation*, applies when a roadway is designed to function as a freeway, a divided-highway, or access-controlled highway. This warrant is not applicable to this project. Although the King Coal Highway will be a divided highway, access will be only partially controlled.

The next warrant, *reduction of bottlenecks or spot congestion*, can be applied to partially-controlled access highways where there is a need to eliminate random signalization to improve the free-flow characteristic of the highway. If, during the final design of the proposed facility, it is determined that a signal is warranted with the peak hour warrant, grade separation of "through movements" and creation of a connector road in one or two quadrants will be evaluated.

The third warrant, improved safety relates, to disproportionately high accident rates, and cannot be applied to a non-existing facility.

The fourth warrant, *site topography*, will be applied to the proposed highway. During final design of the proposed facility, it may be difficult to have at-grade intersections with the proposed highway and a grade separation may be the only practicable and feasible alternative due to the extreme topographic relief of the study area.

The fifth warrant, *roadway-use benefit*, is applicable to existing facilities where congestion exists.

The last warrant is a *traffic volume* warrant which is associated with a signalized intersect that is over capacity or elimination of conflicts with high crossing volumes. This warrant can be used in conjunction with the second warrant. If the cross traffic is expected to be high and the volumes are expected to meet the peak hour signal warrant, then a grade separation or an interchange could be warranted.

2.6 TRAFFIC AND TRANSPORTATION ANALYSIS

2.6.1 METHODOLOGY

2.6.1.1 Travel Demand Model

A travel demand model was chosen as the primary analysis tool to predict the number of vehicle trips for the study route (US 52) and proposed new additions in the study area. The travel demand model developed and applied in this study was created in the Quick Response System (QRSII) Version 4 Software. The modeling approach applies the traditional "four steps" of transportation planning which are: trip generation, trip distribution, modal split, and traffic assignment.

The four step planning process provides a mathematical means of describing both the magnitude and direction of travel within a defined transportation system. Travel demand consists of traversing to and from points both within and outside the system. The origin and destination of travel patterns are represented in the model through a definition of Traffic Analysis Zones (TAZs) which depict the trip making characteristics of individual areas. Socio-economic data is assembled for the TAZs to develop estimates of the number of trips going into and out of each TAZ on a typical day. Transportation supply is measured in terms of how the available transportation facilities serve the desired travel patterns. The transportation supply is defined in the model in terms of a network which depicts the available roadway facilities.

2.6.1.2 The Modeling Process, Coverage, and Execution

The purpose of developing a travel demand model is to assess the performance of a transportation system and its parts under various conditions of change in demand patterns and alterations to the transportation system. The model uses various mathematical relationships to estimate how traffic would move through the system, and accumulates traffic volumes moving over each link to produce traffic flow patterns. The goal is to create a model that replicates existing traffic patterns. The model tests how the system would perform under various conditions of changing traffic volumes and physical improvements to the transportation system, such as the introduction of the King Coal Highway. The modeling objective is to forecast the volume of traffic that would be carried by each of the Build Alternatives. The design year for the King Coal Highway was established as 2020.

Census Block Numbering Areas were used as the basis for creating TAZs and were further subdivided into smaller units to define the TAZs. Travel from outside of the designated study region is represented on the model boundaries through a series of external stations which are used as "gateways" to reflect travel originating from outside the study area.

The scope of the model was broad enough to capture potential regional traffic impacts in the study area. Separate model runs were done for each Build Alternative and the results depicted reflect the influence of each Build Alternative independently. The completed model included 109 TAZs with a total of 56 TAZs directly encompassing the King Coal Highway study area.

The trip generation component involves the estimation of zonal trip ends (i.e. productions and attractions) for the study area and estimates trips for each TAZ based on the trip generation parameters and the underlying socio-economic data. The productions and attractions from trip generation are converted to origin and destination (O-D) pairs. Considering the rural nature of the study area and lack of any existing mass transit system, the model considers only automotive modes of transportation. Network assignment represents the final step in the modeling process. Assignment determines the travel paths taken through the network for each trip between all O-D pairs.

Ground counts received from WVDOT provided the basis for comparison. During calibration runs, the assignment results were tabulated for roadway segments in the network where counts were available. The simulated volumes were compared to the actual volumes on both an individual and total basis. Totaling all segments in the base year model against the available counts yielded less than a 1% difference from the counts.

2.6.2 TRAVEL DISTANCE AND TRAVEL TIME

The King Coal Highway will traverse the northwest to southeast corridor between Williamson in Mingo County and Bluefield in Mercer County, West Virginia. US 52 (study route) is the primary highway system between Williamson and Bluefield, West Virginia. The King Coal Highway will link to major facilities including US 119 (Appalachian Corridor G), US 52, I-77, and US 460.

The Build Alternatives for the King Coal Highway share a common route for approximately 100 kilometers (62 miles), but vary in terms of their termini. The discussion below describes the existing travel routes within the Build Alternatives and how communities are linked. The existing travel routes are primarily two-lane roads with varying speed limits less than 110 kilometers (70 miles) per hour. The corresponding traffic attributes in 2020 under the No Build scenario (e.g. travel times and distances) are presented in Tables II-5 for the existing facilities that will be impacted by the Build Alternatives.

TABLE II-5
2020 NO BUILD TRAFFIC CHARACTERISTICS

Trip	Route	Travel Distance kilometers (miles)	Travel Time (minutes)	Average Speed kilometers (miles)	Build Alternatives with Potential Influence
Chattaroy to Delbarton	Mingo County 14	10 (6)	10	60 (36)	2, 2A, 2D, PA**
Belo to Delbarton	WV 65	13 (8)	9	87 (53)	2B, 2C, 2E, PA
Delbarton to Ikes Fork	US 52	55 (34)	57	58 (37)	All
Ikes Fork to Crumpler	*	66 (41)	61	*	All
Crumpler to Bramwell	*	29 (18)	27	*	2A, 2C
Bramwell to I-77	US 52	11 (7)	20	33 (21)	2A, 2C

Note: * No Direct Connection in Existing Network; **Williamson Connector

The Build Alternatives generally follow mountain ridge tops through new travel corridors and do not closely follow the path of existing facilities. The Build Alternatives will introduce new travel paths causing a redistribution effect on current travel patterns.

The Build Alternatives originate at the intersection of US 52 and US 119. From this intersection, the alternatives follow two different paths until they converge in Delbarton. From Delbarton, the Build Alternatives travel a southern route which parallels US 52. Crossing over Mingo County 9, the Build Alternatives ascend to the ridge top and follow it easterly for approximately 40 kilometers (25 miles).

The Build Alternatives follow Indian Ridge eastward to Crumpler. From Crumpler, the Build Alternatives separate and follow two different paths to their terminus at the US 52/I-77 Interchange. Alternatives 2 and 2B continue east from Crumpler and connect to US 52 less than 1.6 kilometers (1.0 mile) south of the US 52/I-77 Interchange. Alternatives 2 and 2B follow US 52 to the US 52/I-77 Interchange.

Alternative 2D and Alternative 2E follow the same path as Alternatives 2 and 2B east from Crumpler to Stony Gap. At Stony Gap, Alternative 2D and 2E follow existing US 19 and US 460 south to the intersection with US 52. From this intersection, Alternative 2D and 2E follow US 52 northeasterly to the US 52/I-77 interchange.

The Preferred Alternative also follows the same path as Alternatives 2, 2B, 2D, and 2E east from Crumpler to Hurricane Ridge. At the top of Hurricane Ridge however, the Preferred Alternative veers south, crossing WV 123. The Preferred Alternative then traverses Stony Ridge in a southerly direction where it crosses US 19 and US 460 to the intersection with US 52. The Preferred Alternative then follows US 52 northeasterly to its terminus at the US 52/I-77 Interchange.

Alternatives 2A and 2C travel south from Crumpler and connect to US 460 in Tazewell County, Virginia. Alternatives 2A and 2C follow US 460 northeasterly to US 52. Connecting to US 52, the alternatives follow this route to their terminus at the US 52/I-77 Interchange.

Considering that the Build Alternatives follow the mountain ridge tops, access to any of these proposed facilities will be through controlled access points. Access will be provided where feasible, but in many cases could require slight relocation of existing roadways or the construction of access roads.

Future traffic conditions on the existing roadway network for travel movements which will potentially be improved by the Build Alternatives are shown in Table II-6. Some travel patterns, such as Ikes Fork to Crumpler and Crumpler to Bramwell, are not directly connected by the existing network but will be facilitated by the Build Alternatives. The Build Alternatives will provide faster links to traverse the entire study area and consequently attract through traffic.

2.6.3 TRAFFIC ANALYSIS

The effectiveness of each Build Alternative can be measured through the projected travel demand, travel times, and distances traveled along the segments comprising each Build Alternative.

Major parameters that affect traffic projections include the system linkage points (i.e. which facilities are connected) and how individual communities are linked to the highway system. Each of the Build Alternatives were coded into the network model separately. Access points were defined by the intersection of the Build Alternatives with existing roadway segments. Each Build Alternative represents different combinations of travel paths between points of destination in the study area. The projected traffic volumes along individual segments will vary among the Build Alternatives depending upon which Build Alternative, as a whole, provides the best access, system linkage, and travel paths. Quantifying the traffic characteristics of each Build Alternative helps to describe the interaction of travel paths among common destination points. The corresponding analysis requires quantifying these variables on a section level, and then summarizing them on a Build Alternative basis to determine each Build Alternative's total traffic volume, travel time, and distance.

The study area was divided into five sections to isolate and describe the traffic characteristics of each Build Alternative (Exhibit II-5). The sections are defined as follows:

- Section I from the project origin to Delbarton.
- Section II from Delbarton to Ikes Fork.
- Section III from Ikes Fork to Crumpler.
- Section IV from Crumpler to Bluefield.
- Section V from Bluefield to the project terminus.

The projected ADT, travel distance, and travel time were summarized for each Build Alternative within the defined section boundaries (Table II-6). The ADT volumes represent the highest link volume on the new facility within the defined section limits. The travel times reported in Table II-6 are free flow rather than congested times, based on the assumption that the new facility will be designed to accommodate traffic at a high LOS. The section summaries depict how travel corridors serve travel between individual communities. This insight is needed to understand what travel patterns will be served, which cannot be gained from looking at the entire Build Alternative as a whole.

The Build Alternatives bypass many of the larger towns such as Gilbert, Iaeger, Welch, and Keystone. The diversion of traffic from existing US 52 to the Build Alternatives will involve changes in travel paths. The traffic using the Build Alternatives is essentially through traffic which will travel on the new facility through the entire study area.

For Section I, the traffic volume on the Preferred Alternative (PA) and Alternatives 2B, 2C and 2E would divert the most traffic from the existing roadway. The remaining alternatives carry similar traffic volumes. In Section II, Alternatives 2B, 2C, 2E, and the PA, are projected to carry more traffic than Alternatives 2, 2A, and 2D. This differential in traffic volumes is due, in part, by the influence of Section I. In Section III, All of the Alternatives follow the same alignment and carry the same volume of traffic. In Section IV, Alternatives 2A and 2C attract more traffic than the other four alternatives and the PA because Alternatives 2A and 2C replace the existing traffic and facilitate all of U.S. 52 traffic instead of some portion that would be diverted to the new facility. In Section V, Alternatives 2A and 2C again attract more traffic than the other four alternatives and the PA for the same reason as that discussed above.

Of the six Build Alternatives and the PA, Alternatives 2A and 2C will attract more traffic because they will provide the most access to local communities in the Bluefield area. However, Alternatives 2A and 2C are also the longest Alternatives. In summary, all of the Build Alternatives will provide faster links to traverse the study area and will reduce the total travel time from the project origin near Williamson to the terminus near Bluefield from approximately 2 hours and 40 minutes to approximately 1 hour and 27 minutes.

2.7 EASTERN TERMINUS ANALYSIS

The eastern terminus for the King Coal Highway is to be the existing interchange of Interstate 77 and US 52 located in the vicinity of Bluefield, West Virginia. Although Final Design will allow for upgrades and modification of existing facilities that will make up the King Coal Highway, preliminary studies to identify potential geometric constraints for the existing eastern terminus was studied.

The facilities in their current geometric layout were evaluated under a future No Build and future Build for the alternatives. An analysis was performed using the Transportation Research *Board Special Report 209, Highway Capacity Manual Third Edition, 1994*, and the related software to determine the level of service (LOS) for the ramp merge and diverge areas.

TABLE II-6
2020 BUILD TRAFFIC VOLUMES

BUILD ALTERNATIVE	Section I Project Origin to Delbarton			Section II Delbarton to Ikes Fork			Section III Ikes Fork to Crumpler			Section IV Crumpler to Bluefield			Section V Bluefield to Project Terminus			Total Williamson to Bluefield	
	ADT	D	T	ADT	D	T	ADT	D	T	ADT	D	T	ADT	D	T	D	T
2	11,700	20.0 (12.4)	11	12,300	47.8 (29.7)	27	14,000	52.0 (32.3)	30	14,500	24.8 (15.4)	14	22,000	4.8 (3.0)	3	149 (93)	86
2A	11,700	20.0 (12.4)	11	12,300	47.8 (29.7)	27	14,000	52.0 (32.3)	30	29,300	22.4 (13.9)	13	31,000	17.1 (10.6)	10	159 (99)	91
2B	12,200	19.6 (12.2)	11	14,000	47.8 (29.7)	27	14,000	52.0 (32.3)	30	14,500	24.8 (15.4)	14	22,000	4.8 (3.0)	3	149 (93)	85
2C	12,200	19.6 (12.2)	11	14,000	47.8 (29.7)	27	14,000	52.0 (32.3)	30	29,300	22.4 (13.9)	13	31,000	17.1 (10.6)	10	159 (99)	91
2D	11,700	20.0 (12.4)	11	12,300	47.8 (29.7)	27	14,000	52.0 (32.3)	30	14,500	24.8 (15.4)	14	22,000	7.3 (4.5)	4	152 (95)	87
2E	12,200	19.6 (12.2)	11	14,000	47.8 (29.7)	27	14,000	52.0 (32.3)	30	14,500	24.8 (15.4)	14	22,000	7.3 (4.50)	4	151 (94)	87
PA	12,200	19.6 (12.2)	11	14,000	47.8 (29.7)	27	14,000	52.0 (32.3)	30	14,500	25.2 (15.6)	14	22,000	5.3 (3.3)	3	151 (94)	87

Note: ADT = Average Daily Traffic
D = Distance in kilometers and (miles)
T = Time in minutes
Numbers are rounded

The results are reported by LOS. A LOS of 'A' represents unrestricted operations, where merging and diverging does not impact the through traffic. In contrast, a LOS of 'F' constitutes a complete break down of traffic flow, unpredictable stoppages of traffic flow, and gridlock.

The results of this analysis are summarized in Table II-7.

Regardless of the alternative chosen, the additional traffic expected to result from the construction of the King Coal Highway would not cause the existing ramps of this interchange to operation at unacceptable levels of service.

TABLE II-7
LEVELS OF SERVICE

Movement	2020 Alternatives		
	No Build	2A, 2B, 2D, 2E & PA	2A & 2C
Northbound I-77 Off-ramp	B	C	B
Northbound I-77 On-ramp	B	B	B
Southbound I-77 Off-ramp	B	B	B
Southbound I-77 On-ramp	B	C	C

ALTERNATIVES EXHIBITS

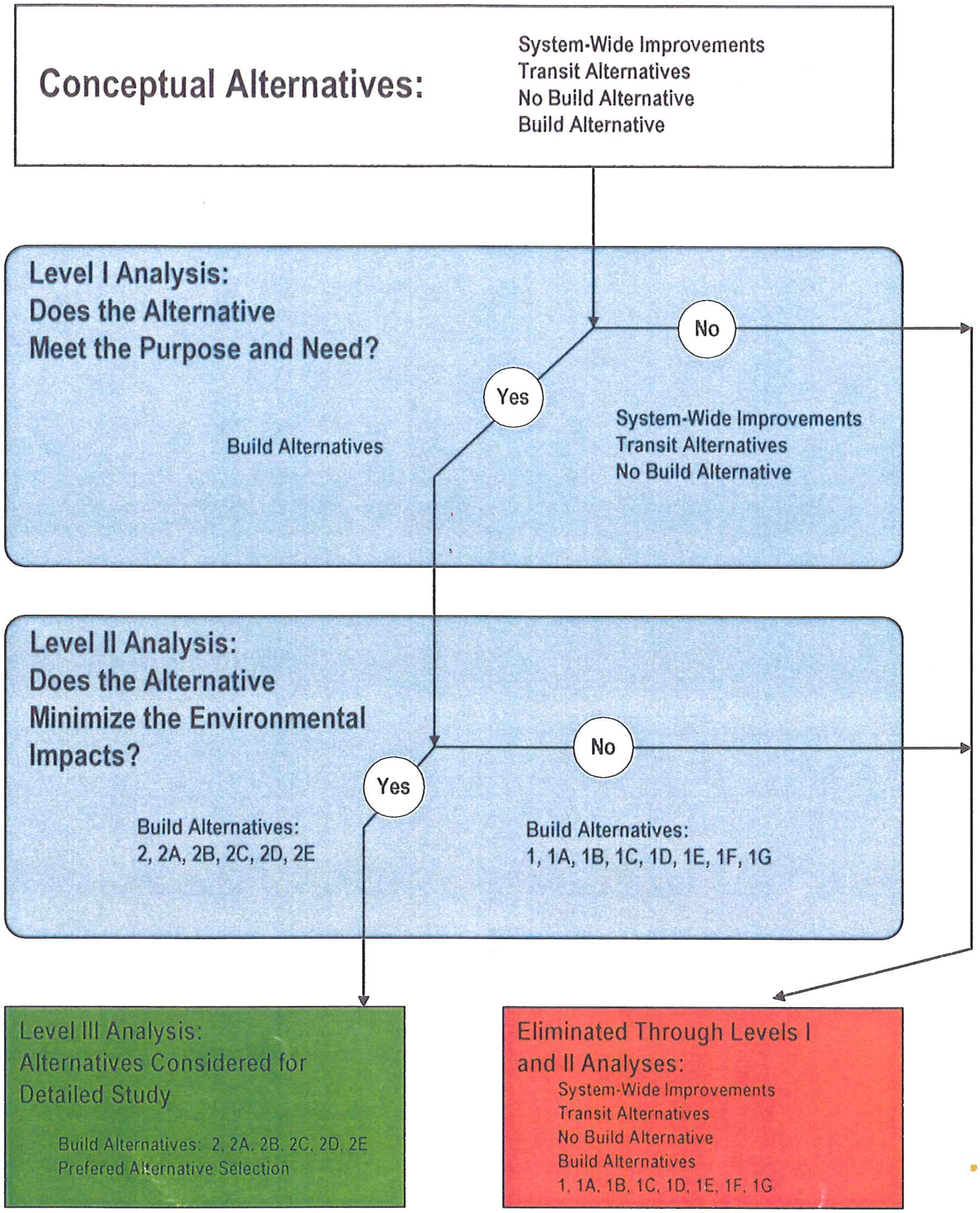


Exhibit: II-1

KING COAL HIGHWAY
ALTERNATIVES ANALYSIS
SCREENING PROCESS

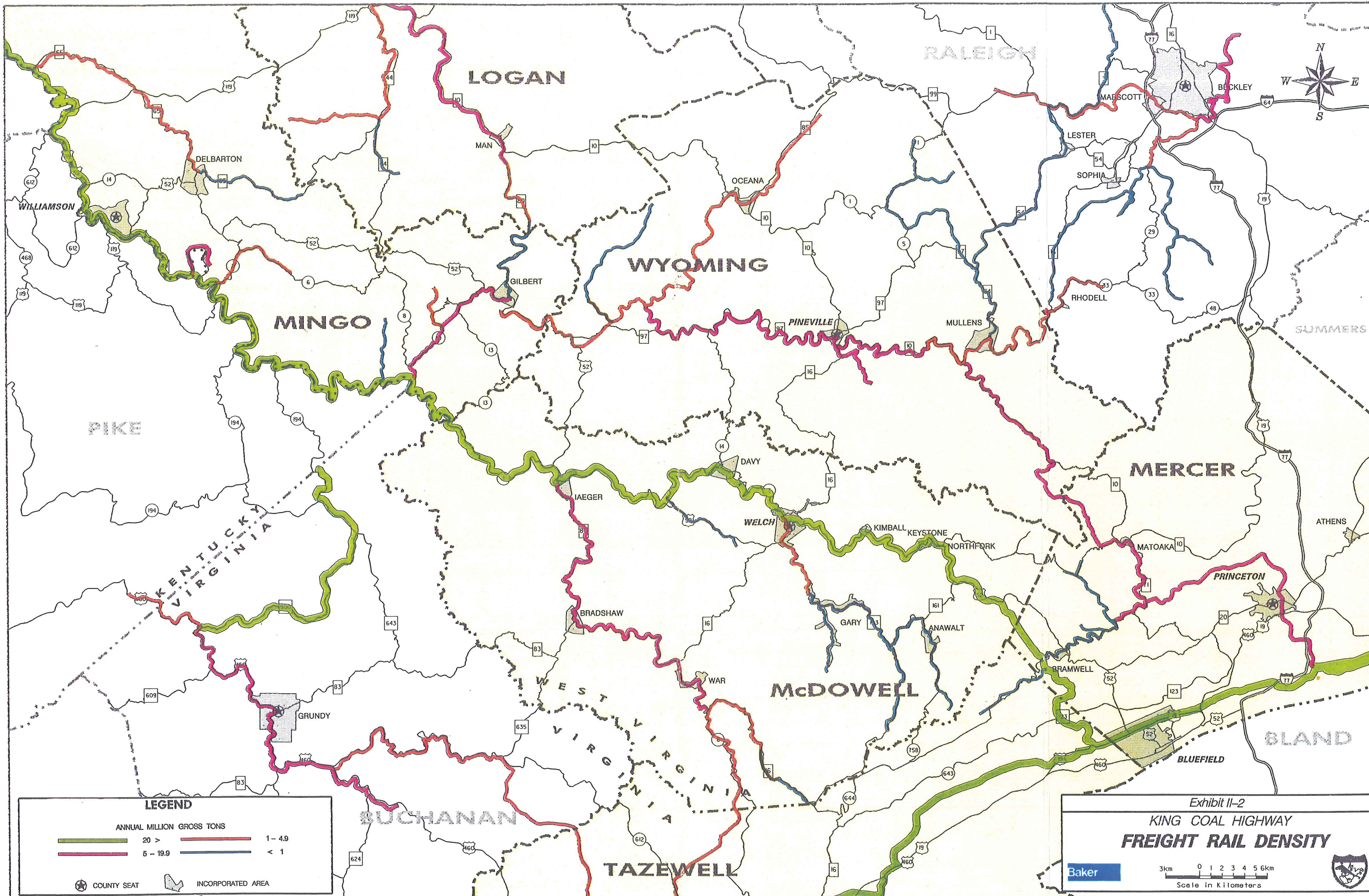
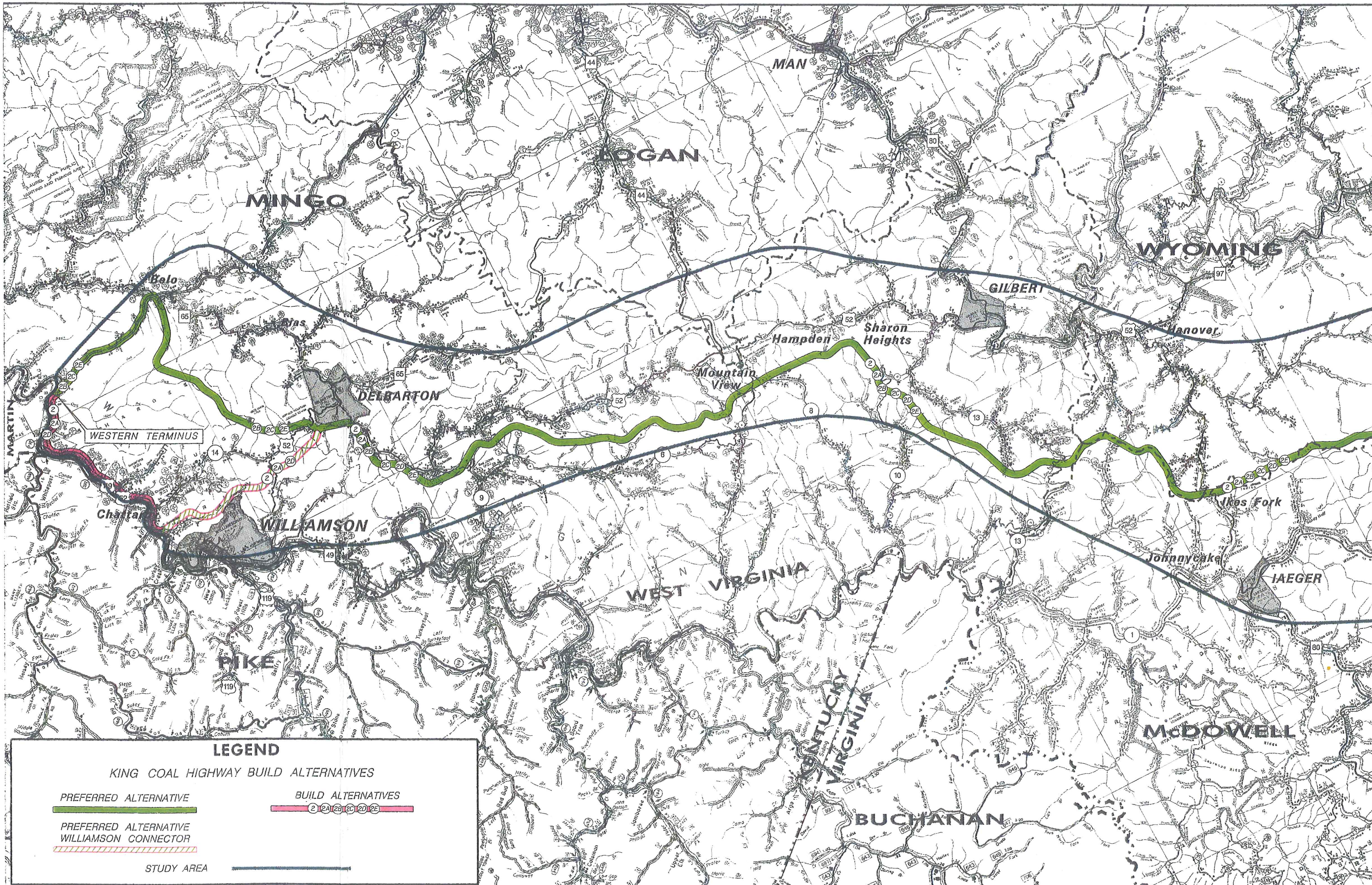


Exhibit II-2
KING COAL HIGHWAY
FREIGHT RAIL DENSITY


MINGO
LOGAN
MAN
WYOMING
GILBERT
Hanover
Belo
Hampden
Sharon Heights
Mountain View
DELBARTON
WESTERN TERMINUS
WILLIAMSON
Chattaroy
Ikes Fork
Johnnycake
IAEGER
WEST VIRGINIA
KENTUCKY
VIRGINIA
PIKE
McDOWELL
BUCHANAN
MARTIN
LEGEND
KING COAL HIGHWAY BUILD ALTERNATIVES
PREFERRED ALTERNATIVE
BUILD ALTERNATIVES
2 2A 2B 2C 2D 2E
PREFERRED ALTERNATIVE WILLIAMSON CONNECTOR
STUDY AREA

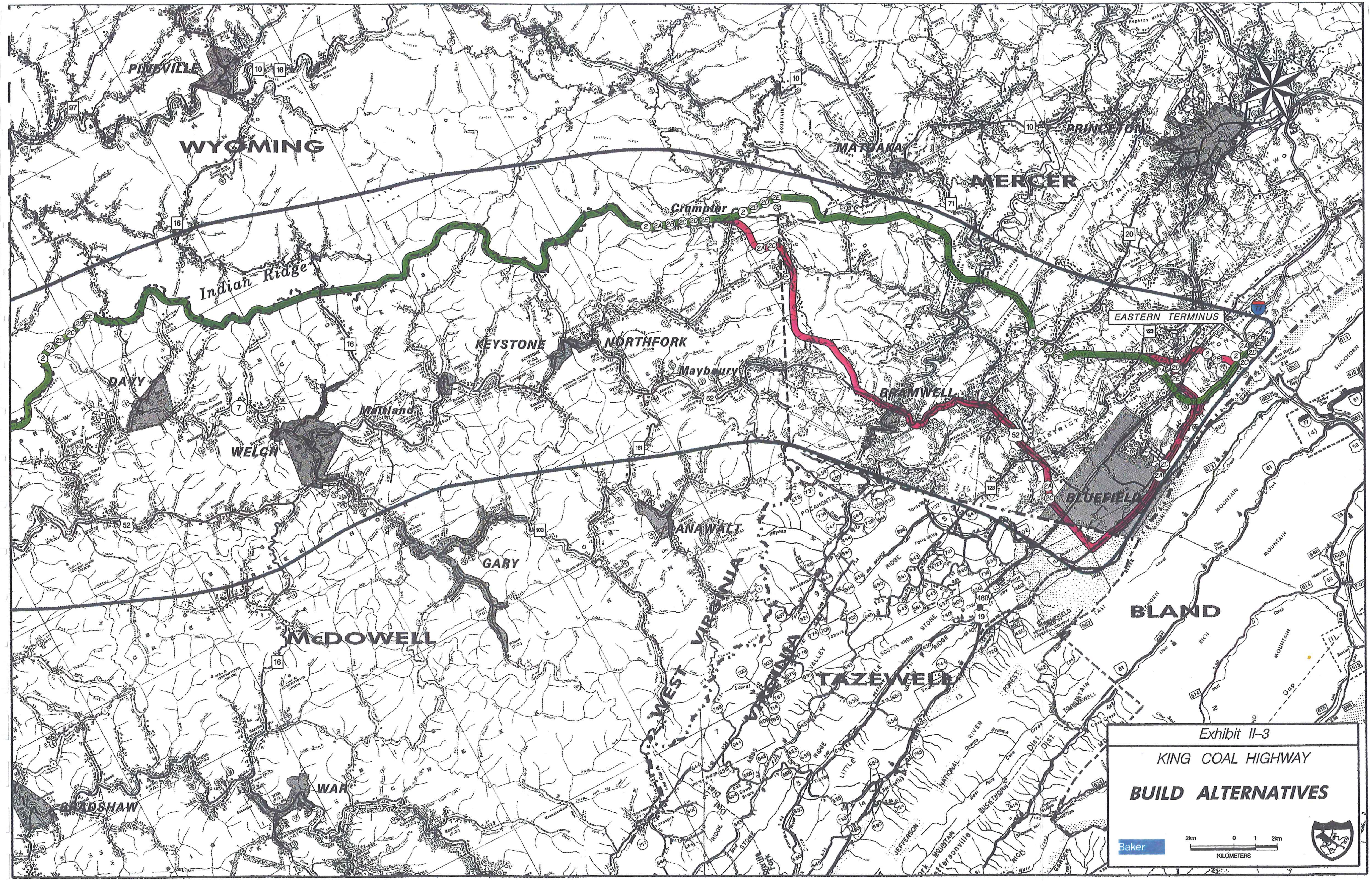
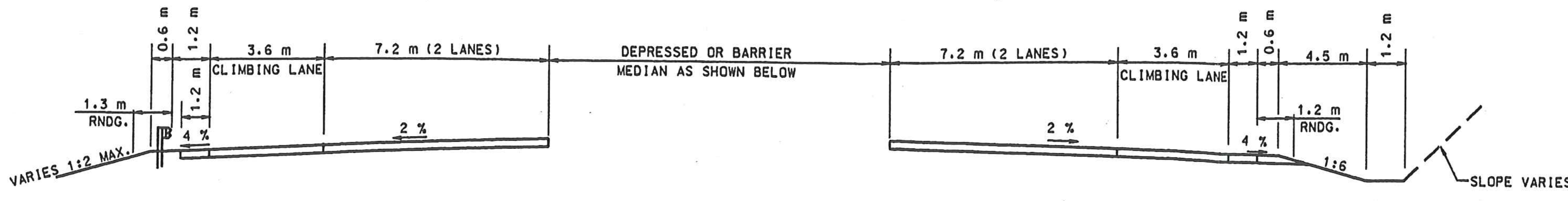


Exhibit II-3

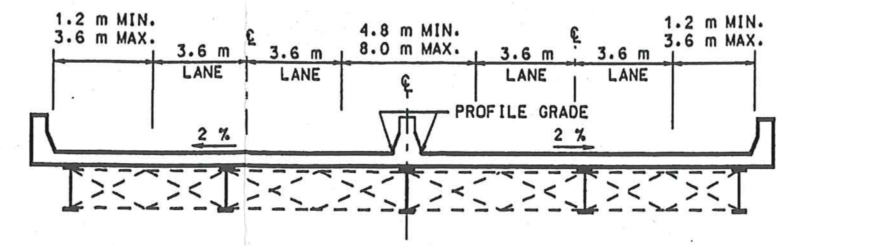
KING COAL HIGHWAY

BUILD ALTERNATIVES

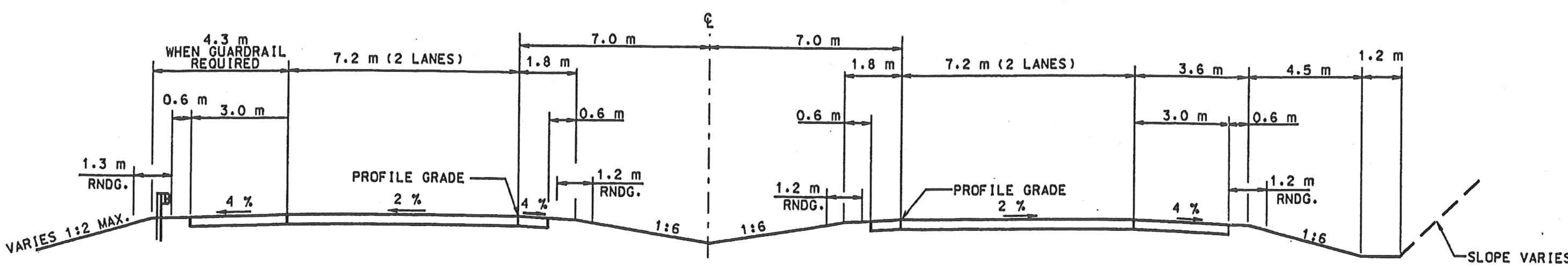
NORMAL SECTION WITH CLIMBING RIGHT OR LEFT AS REQUIRED



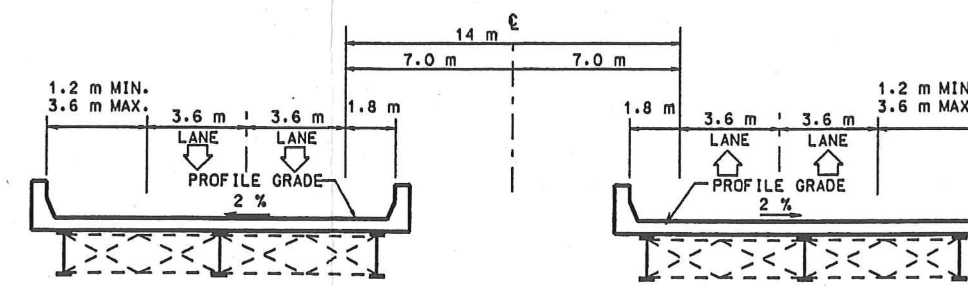
BRIDGE CARRYING MAINLINE ROADWAY WITH BARRIER MEDIAN



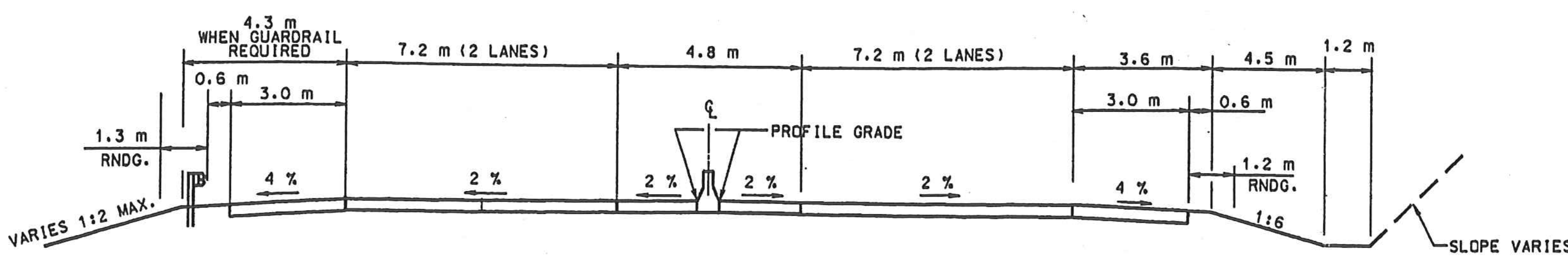
NORMAL SECTION WITH DEPRESSED MEDIAN



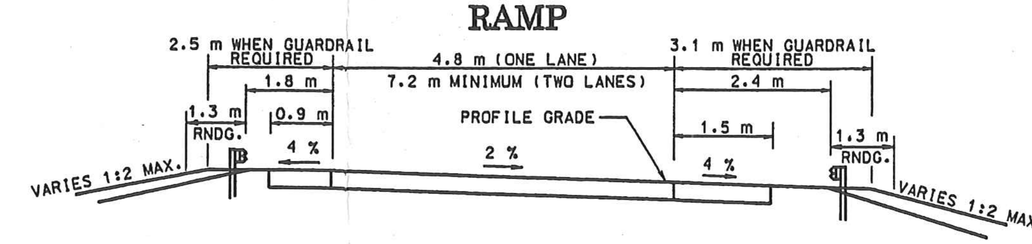
BRIDGE CARRYING MAINLINE ROADWAY WITH 14 METER MEDIAN



NORMAL SECTION WITH BARRIER MEDIAN



RAMP



EQUIVALENT DIMENSIONS :

0.6 m = 2'	3.0 m = 10'
0.8 m = 2.6'	3.1 m = 10.2
0.9 m = 3'	3.6 m = 12'
1.1 m = 3.6'	4.3 m = 14.1'
1.2 m = 4'	4.5 m = 15'
1.3 m = 4.5'	4.8 m = 16'
1.5 m = 5'	7.0 m = 23'
1.8 m = 6'	8.0 m = 26'
2.4 m = 8'	
2.5 m = 8.2'	

BRIDGE WIDTHS SHOWN ABOVE ARE FOR 4-LANE ROADWAYS.
WIDTHS WOULD INCREASE TO ACCOMMODATE RAMPS; AND
WIDTHS WOULD INCREASEWHERE ADDITIONAL THRU LANES ARE REQUIRED.

Exhibit II-4

KING COAL HIGHWAY

TYPICAL SECTION

Baker

/y94usr2/shawnee/sdeis/typxsec.dgn 21-MAR-2000 18:32

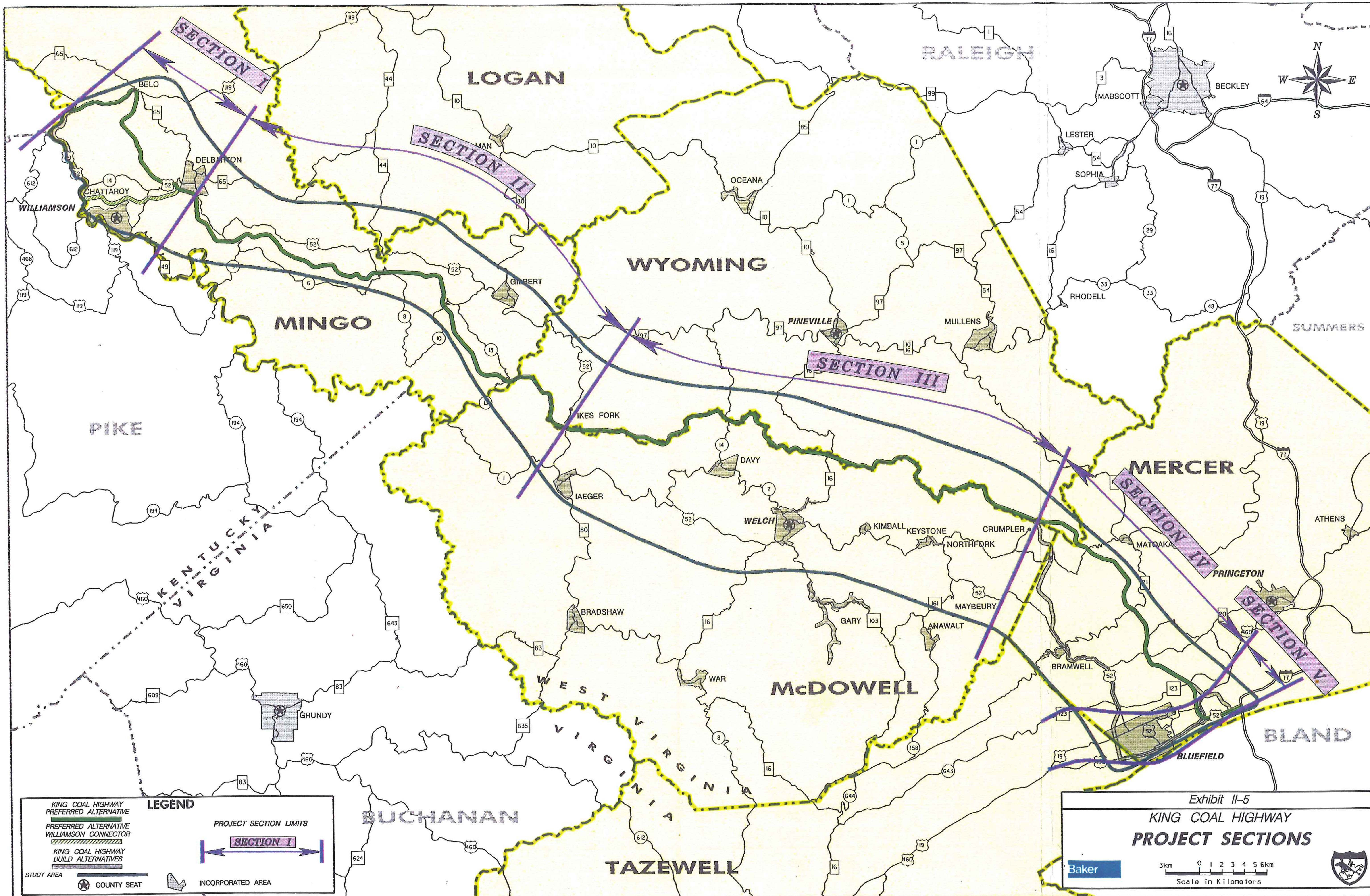


Exhibit II–5

KING COAL HIGHWAY

PROJECT SECTIONS

SECTION III: AFFECTED ENVIRONMENT

This section provides a description of the social, natural, and physical environments in the King Coal Highway study area. Impact assessments and potential mitigation measures are presented in *Section IV: Environmental Consequences.* Detailed study area data that were used to prepare this section are provided in the referenced Technical Reports (*Volume I: Traffic/Transportation, Natural, and Physical Environment Appendix and Volume II: Cultural Resource Appendix*).

3.1 SOCIAL ENVIRONMENT

The study area is situated in the Appalachian Mountains of southern West Virginia and western Virginia. It includes Mingo, Logan, McDowell, Wyoming, and Mercer counties, West Virginia and Tazewell County, Virginia. Most of the area has historically developed around the coal industry, including land use, population characteristics, community services, housing development, economy, and transportation opportunities. The area is characterized by high unemployment and isolation and is part of the Appalachian Regional Commission's Central Appalachian Region. As such, it has been characterized by Widner as the "area [of Appalachia] in which the most severe human and economic problems and isolation have existed." (Widner, 1990).

Over the last two decades, the study area has experienced a decline in its economy and population due in part to changes in the coal industry. As technology has improved, fewer people are required to maintain production levels in the coal mines. As a result, the study area has a high unemployment rate and high state and federal income supplements. Because of the terrain and connection to the coal industry, most communities have developed around coal mines and along streams in valleys. As unprofitable coal mines close and as the work force in active mines is reduced, the primary source of income is removed from the economy, and the community facilities and infrastructure become increasingly harder to maintain.

Regional and local isolation increases the effects of unemployment in the study area. With access to the interstate highway system provided by a limited and inefficient roadway system, living within the study area and working outside the study area becomes less feasible. People in the study area wanting to work elsewhere are inhibited by travel times and distances. Inefficient travel throughout the study area also discourages new businesses from moving into the region. These issues cause young, working age individuals to relocate outside of the study area.

Economic diversification has occurred in some study area communities (e.g. Bluefield). This diversification decreases dependence on the coal industry and expands employment opportunities. Economic diversification has not occurred frequently or uniformly throughout the study area.

3.1.1 LAND USE AND LAND COVER

The current land use and land cover patterns reflect the history and topography of the study area (Exhibit III-1). Currently, over 85 percent of the study area is forested by second and third growth forests that have recovered following the deforestation of the 19th and early 20th centuries. Settlement during the logging industry's growth and the coal industry's growth was concentrated in the narrow valleys centered around industrial operations. Because of the topography of the area there are few farms. Portions of the study area are covered by non-vegetated abandoned strip mine operations.

Development in the narrow valleys is along the creeks and is generally associated with coal mines (abandoned or active). These communities are characterized by standard small "coal company" houses located on both sides of a small road leading to an active or inactive mine entrance.

3.1.2 POTENTIAL GROWTH AREAS

Currently, limited development is occurring in the major municipalities (Williamson, Welch, and Bluefield) along the valleys and existing transportation corridors. In the Welch/central McDowell County vicinity, US 52 between Welch and Kimball is being considered by the regional planners as a potential growth corridor. Local officials in West Virginia identified terrain and a lack of infrastructure (roads, water, and sewer service) as factors impeding development (Region II, 1992).

In the Region I *Regional Development Plan* (1990), businesses identified as having potential future success for the area are: value-added wood products, information management, tourism, food processing, warehousing and distribution, and value-added coal. Most of these types of businesses are dependent on the transportation network. It is believed by regional planners that given the available labor pool and the study area's proximity to eastern and southern markets, that the region is ideally situated to attract food processing, warehousing, and distribution companies. It is also the opinion of regional planners that the diversification into industries other than coal is essential for the region's economic health. Exhibit III-2 depicts potential growth areas identified within the study area. These areas are characterized as having the needed infrastructure and topographic setting to support future growth.

Specific areas that are planned for industrial development are: a 500-acre industrial park on the McDowell side of the county line with Wyoming County, between WV 16 and County Rt. 7/2; and a 15-acre industrial park on the Wyoming County side of the line. The industrial park is also a candidate site for a proposed federal prison. There are no sites presently identified for industrial development in Mingo County; however, the County is in the midst of an extensive effort to add water and sewer capacity throughout the County. Industrial parks in Tazewell County, Virginia are at or near capacity, but numerous undeveloped sites are available with the potential for investment by industry. Private developers could easily be attracted to sites that will be well served by infrastructure, such as the area near the Bluefield airport. In general, topographic and floodplain constraints will limit the areas that can support future large-scale development.

Residential development sites are more difficult to predict. The employment base in the southern end of the corridor, including Tazewell County, Virginia, is attracting residents to western Mercer County. There are numerous abandoned settlements in western Mercer County that would be suitable for new residential development if they became more accessible.

3.1.3 COMMUNITY ENVIRONMENT

3.1.3.1 Population and Community Cohesion

The most important factor that has shaped the study area is the loss of population. As the Region I Planning and Development Council noted (1990), the population decrease has caused ripple effects throughout the social and economic environment of the entire central Appalachian region.

Total population in the study area counties decreased between 1980 and 1990 (Table III-1). This decrease was likely due to the decrease in employment within the study area. This decrease in employment caused people to move outside (out migration) the study area to seek or accept employment. Between 1990 and 1995 the rate of population decrease seems to have declined, with some of the study area counties showing slight population increases (Table III-1).

TABLE III-1
STUDY AREA POPULATION

County	1980	1990	1991	1992	1993	1994	1995
Mingo, WV	37,336	33,739	33,778	33,423	33,869	33,960	33,646
Logan, WV	50,679	43,032	42,991	42,797	43,058	42,889	42,451
McDowell, WV	49,899	35,233	34,430	34,033	33,574	33,099	32,662
Wyoming, WV	35,993	28,990	28,874	29,018	28,627	28,481	28,213
Mercer, WV	73,942	64,980	64,773	64,999	65,193	65,114	64,889
Tazewell, VA	50,511	45,960	46,602	46,821	47,064	46,993	47,146
TOTAL:	298,360	251,934	251,448	251,091	251,340	250,536	249,007
West Virginia	1,949,644	1,793,477	1,798,866	1,807,041	1,818,466	1,823,623	1,828,140
Virginia	5,346,818	6,189,197	6,286,654	6,389,114	6,474,955	6,551,380	6,618,358

Sources: U.S. Department of Commerce, 1980, 1992a, 1992b, and 1996.

Because Logan County, West Virginia and Tazewell County, Virginia make up such a small portion of the study area, population increases within these counties do not have a large effect on the population living within the study area.

The age distribution of the population within the study area counties has also changed (Table III-2). Between 1980 and 1990, the only age group to increase was the 65 years and older group. In all study area counties, the percentage population decrease in the 0 to 19 age group is greater than the decrease for the total population. The 20 to 44 age group decrease generally parallels the decrease in total population. While all other age groups have decreased, the over 65 age group still makes up a relatively small percentage of the total population.

TABLE III-2
POPULATION AGE DISTRIBUTION AND SIZE

County	1980 Total	1990 Total	Percent Change Total	1990 Percent Over 65
Mingo, WV	37,336	33,739	-9.6%	10.4%
Logan, WV	50,679	43,032	-15.1%	12.4%
McDowell, WV	49,899	35,233	-29.4%	14.8%
Wyoming, WV	35,993	28,990	-19.5%	10.9%
Mercer, WV	73,942	64,980	-12.1%	16.6%
Tazewell, VA	50,511	45,960	-9.0%	13.6%
TOTAL	298,360	251,934	-15.6%	13.6%
West Virginia	1,949,644	1,793,477	-8.01%	15.0%
Virginia	5,346,818	6,187,358	15.7%	10.7%

	Percent Change 1980 to 1990			
County	0-19 years	20-44 years	45-64 years	65 + years
Mingo, WV	-21.0%	-2.52%	-8.25%	9.92%
Logan, WV	-27.6%	-11.1%	-11.9%	11.8%
McDowell, WV	-40.6%	-25.5%	-30.4%	1.38%
Wyoming, WV	-32.4%	-17.5%	-11.9%	19.0%
Mercer, WV	-24.2%	-11.1%	-10.8%	13.1%
Tazewell, VA	-22.6%	-8.1%	-4.2%	23.2%
TOTAL	-28.1%	-12.6%	-12.9%	12.8%
West Virginia	-20.1%	-4.80%	-7.03%	13.1%
Virginia	1.2%	25.0%	12.6%	32.0%

Sources: U.S. Department of Commerce, 1980, 1992a, and 1992b.

Approximately 94 percent of the study area population is white (Table III-3). The percentage of minorities in the study area counties ranges from just over one percent (Wyoming) to a high of almost 14 percent (McDowell) for 1990.

TABLE III-3
RACIAL DISTRIBUTION

County	1980		1990	
	Percent White	Percent Minority	Percent White	Percent Minority
Mingo, WV	96.9%	3.1%	97.4%	2.6%
Logan, WV	95.2%	4.8%	96.2%	3.9%
McDowell, WV	85.0%	15.0%	86.5%	13.6%
Wyoming, WV	98.6%	1.4%	98.8%	1.2%
Mercer, WV	92.6%	7.4%	93.3%	6.7%
Tazewell, VA	97.0%	3.0%	96.9%	3.1%
Total	93.8%	6.2%	94.7%	5.3%
West Virginia	92.6%	3.8%	96.2%	3.8%
Virginia	79.2%	20.8%	77.4%	22.6%

Sources: U.S. Department of Commerce, 1980, 1992a, and 1992b.

Community Cohesion

Community cohesion is defined as the connections between and within communities that are essential for serving the needs of the residents (USDOT, 1991). In a rural area, it is important to retain community structure while providing links to other rural communities. These links facilitate access to public and private services, such as access to a regional hospital, county library, secondary school serving a large area, or retail store.

Transportation throughout the study area is essential in maintaining community cohesion. The following routes provide access between the communities in the study area: US 52; WV 80; WV 20; US 119; WV 65; McDowell County 7; WV 161; WV 103; McDowell County 14; WV 44; WV 123; McDowell County 17; WV 97; WV 71.

Within communities, pedestrian access is also critical to maintaining cohesion. While there are no dedicated pedestrian facilities within the study area, there are multiple locations where residents cross the road by foot routinely to conduct their daily activities. These locations are typically within the small settlements along US 52 and county roads, and in downtown areas such as in Williamson.

There are over 100 unincorporated and incorporated communities in the study area. The unincorporated communities are generally small and account for approximately 90 percent of all of the communities. Each community has its own cohesive characteristics. With the consolidation of some community facilities (e.g. school districts, health care facilities), many communities have developed a stronger interdependence. In its 1964 report to Congress, ARC described the Central Appalachian Region as "narrow ribbons of habitation which wind along valley roads and up tributary hollows, threading among the wooded hills. It suggests, in fact, an endless town,...." Since that time a few new community facilities (e.g. schools, health centers) have been constructed and local and state roads have been improved linking the people of the various communities more closely.

Community Characteristics

A list of the incorporated and unincorporated communities in the study area is provided in Table III-4. Most of the unincorporated communities are composed of a series of residences along a river or stream, with a few businesses and churches to serve the community's needs. The smaller incorporated communities are also concentrated in the valleys, with more businesses, churches, and community services (e.g. medical facilities, volunteer fire departments, and elementary schools). The larger incorporated communities have a range of services available for the residents of the study area, such as supermarkets, secondary schools, libraries, hospitals, and retail services.

TABLE III-4
INCORPORATED AND UNINCORPORATED COMMUNITIES WITHIN THE STUDY AREA

County	Incorporated	Unincorporated
Mingo, WV	Gilbert, *Delbarton,* Williamson	Baisden, *Belo,* Bias, Borderland, Chattaroy, Cinderella, *Goodman,* Hampden, *Hatfield,* Isaban, Lando Mines, Justice, Lobata, Musick, *Nolan,* Pie, Puritan Mines, Ragland, Red Jacket, Sharon Heights, Sprattsville, Surosa, Tamcliff, Taylorville, Varney
McDowell, WV	Davy, Iaeger, Keystone, Kimball, Northfork, Welch	Algoma, Antler, Asco, Ashland, Big Four, Big Sandy, Bottom Creek, Capels, Carswell, Cherokee, Clear Fork Junction, Crumpler, Elkhorn, Ennis, Erin, Gilliam, Havaco, Hemphill, Hensley, Jed, Kyle, Johnnycake, Landgraff, Litwar Longpole, Maitland, Marytown, Maybeury, McDowell, Mohegen, Pando Juverno, Powhatan, Premier, Roderfield, Rolfe, Sandy Huff, Superior, Switchback, Twin Branch, Upland, Vivian, Wilmore, Worth
Wyoming, WV	None	Hanover, Ikes Fork, Steeles, Woolsey
Mercer, WV	*Bluefield, Bramwell*	*Ada,* Bluestone, *Bluewell, Brushfork,* Ceress, Coaldale, Coopers, Crystal, Cumberland Heights, Duhring, Edison, Flipping, Freeman, Goodwill, Godfrey, Littlesburg, Lorton Lick, Maple View, McComas, *Midway,* Montcalm, Nemours, Rock, *Sandlick,* Simmons, *Stony Gap,* Wolfe, Yards
Tazewell, VA	*Bluefield*	none

Sources: County Highway Maps, Field Views 1995.
Note: *Italics* denotes community within Build Alternative; There are no incorporated or unincorporated communities in Logan County, WV.

3.1.3.2 Community Services and Public Safety
Health Care

The principal health care facilities are located in the larger communities that are at the termini and the center of the study area (Exhibit III-3). These facilities include:

- Bluefield Regional Medical Center, Bluefield
- Humana Hospital, Bluefield
- Princeton Community Hospital, Princeton
- Southern Hills Rehabilitation Hospital, Princeton
- Williamson Memorial Hospital, Williamson
- Williamson Appalachian Regional Hospital, Williamson

Other facilities that serve the study area include clinics in Chattaroy (2), Delbarton, Taylorville, Welch (2), and Northfork. In general, the six large facilities are at the termini of the study area, while the clinics are relatively evenly distributed throughout the study area.

Educational Facilities

There are numerous educational facilities throughout the study area (Exhibit III-3). Table III-5 lists the number of primary and secondary schools present within the study area. Most of the secondary schools are located in the larger incorporated towns. Elementary schools are located in both larger incorporated communities and smaller towns. Bluefield State College is located in Bluefield, Virginia. The College of West Virginia is located in Beckley. Bluefield State College offers classes at Mount View High School in Welch, West Virginia.

TABLE III-5
PRIMARY AND SECONDARY EDUCATIONAL FACILITIES
WITHIN THE STUDY AREA

County	Secondary	Primary	Special/ Vocational	Private	Routes Used
Mingo	8	7	1	1	US 52, WV 80
McDowell	5	4	2	0	US 52, WV 16
Wyoming	0	1	0	0	US 52, WV 97
Mercer	2	4	0	1	US 52

Source: West Virginia Department of Education, 1995.
Note: There are no primary or secondary schools within the study area in Logan or Tazewell counties.

Law Enforcement

State and county police are located in Welch, Williamson, Bluefield, and Pineville, West Virginia (Exhibit III-3). Local police departments are located in the following study area locations:

- McDowell County - Kimball, Iaeger, Keystone, Welch, and Northfork
- Mercer County - Bluefield and Bramwell
- Mingo County - Delbarton and Williamson

There are local police departments in Wyoming County, but not within the study area. Adequate transportation access is necessary for law enforcement to function efficiently. The principal routes used by the law enforcement officials are: US 52 (study route), WV 16, WV 49, WV 65, and McDowell County 7.

Fire Protection

Most communities throughout the study area have volunteer fire protection services (Exhibit III-3). Those located in the study area include:

- McDowell County - Iaeger, Keystone, Kimball, Northfork, Roderfield, and Welch
- Mercer County - Bluefield, Bluewell, Bramwell, and Montcalm
- Mingo County - Chattaroy, Williamson, Delbarton, Gilbert, and Baisden
- Wyoming County - Hanover

The routes used by the fire departments based on their locations, during incident response are: US 52 (study route), WV 20, WV 16, McDowell County 7, WV 65, WV 80, and Mingo County 9.

Emergency Medical Services

There are 8 EMS facilities distributed evenly throughout the study area (Exhibit III-3). The facilities are located in the following communities:

- McDowell County - Iaeger, Keystone, and Welch
- Mercer County - Bluefield
- Mingo County - Chattaroy, Williamson, Delbarton, and Gilbert

There are several EMS facilities in Wyoming County but not within the study area. The principle routes these services use would be those en route to medical facilities, which include: US 52 (study route), WV 20, WV 16, WV 103, and WV 80.

3.1.4 ECONOMIC ACTIVITY

The study area has been shaped by its natural resources, timber in the late 1800's and coal thereafter. The historic cycle of the coal industry and its support services has influenced development, population shifts, settlement patterns, economic diversity, community services, and employment. Many people in the study area are employed by the coal industry and supporting businesses. With the coal industry employing fewer people, the study area economy is in the process of being restructured.

The types of businesses in the study area are based on the resources available, existing infrastructure, and the suitability of the area for other types of businesses. The major components of the study area's economic base are the following industries: mining, public utilities, retail trade, state and local government, services, manufacturing, and transportation

3.1.5 EMPLOYMENT AND INCOME

Except for Mercer County, West Virginia, unemployment in study area counties exceeded the West Virginia statewide average. Table III-6 lists unemployment statistics for the study area counties, West Virginia and Virginia.

TABLE III-6
UNEMPLOYMENT

County	1980	1990	1993
Mingo, WV	10.2%	15.5%	13.7%
Logan, WV	12.1%	15.4%	15.7%
McDowell, WV	12.2%	22.0%	15.0%
Wyoming, WV	9.2%	16.5%	17.6%
Mercer, WV	8.5%	9.4%	9.0%
Tazewell, VA	7.0%	9.0%	10.4%
West Virginia	8.4%	9.6%	10.8%
Virginia	4.7%	4.3%	5.2%

Sources: U.S. Department of Commerce, 1980, 1992a, 1992b, and 1995; Center for Economic Research, 1994a and 1994b; Virginia Employment Commission, 1995.

The following table (Table III-7) illustrates how employment in different economic sectors has changed between 1979 and 1991 in study area counties. In areas with a greater variety of human and natural resources, employment has shifted into sectors other than mining.

Mining has been steadily increasing over time in Mingo County, with some fluctuations; it is the only county to experience an increase in this type of employment in the recent past. Transportation, services, and public utilities employment has increased in the last several years while state and local government and retail trade employment has been relatively constant.

In Logan County, mining employment has decreased over time while the other employment sectors have remained relatively steady. Only services has increased, but not to the same extent that mining employment has decreased. Thus, employment has not necessarily shifted from one sector to another. However, the economy does not seem as dependent on mining as in McDowell County, for example.

The decrease in coal employment in McDowell County has been substantial. Employment in the other sectors has remained constant, not necessarily increasing as coal employment dropped. The human resources of the area have not shifted into other areas of employment as coal employment decreased.

TABLE III-7
COUNTY EMPLOYMENT BY MAJOR SECTOR

County, Sector	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Mingo County													
Transportation	1188	1195	1178	1094	1072	1095	1030	1022	1090	1148	1260	1449	1605
Government	1410	1475	1452	1377	1387	1551	1566	1600	1638	1662	1697	1759	1696
Retail Trade	1956	1920	1931	1938	1808	1781	1755	1766	1725	1677	1629	1605	1535
Services	1618	1626	1643	1724	1736	1743	1816	1708	1654	1771	1762	2013	2160
Mining	1960	2724	2698	2656	2159	2438	2332	2562	2650	2744	2740	3080	3133
Logan County													
Transportation	1144	1093	1092	997	883	934	895	895	869	895	829	915	892
Government	1904	1885	1895	1791	1904	1997	1994	1951	1983	2009	1906	2002	1975
Retail Trade	2789	2875	2708	2718	2694	2663	2692	2669	2694	2828	2882	2867	2911
Services	2498	2684	2994	3169	3295	3262	3254	3173	3098	3245	3282	3598	3685
Mining	4579	5092	4458	4760	3308	3258	2957	2696	2572	2639	2594	2756	2771
McDowell County													
Transportation	641	600	593	668	651	625	601	568	489	466	435	558	582
Retail Trade	1900	1906	1810	1697	1688	1683	1601	1518	1445	1511	1476	1384	1339
Services	1727	1747	1737	1687	1641	1555	1443	1450	1426	1311	1272	1206	1268
Government	2108	2396	2267	2060	2020	2021	2057	2065	2095	1927	1827	1918	1905
Mining	7859	7587	6236	5874	4555	4408	4323	3764	1452	1411	1630	1682	1418
Wyoming County													
Transportation	676	713	662	656	667	683	681	661	602	544	545	575	622
Retail Trade	1207	1204	1160	1250	1211	1209	1214	1254	1221	1156	1122	1173	1193
Services	1074	1097	1122	1128	1145	1127	1153	1154	1177	1086	1115	1145	1115
Government	1333	1247	1338	1334	1351	1352	1399	1416	1381	1376	1330	1376	1337
Mining	5208	4972	4343	4494	3180	3062	2523	2193	2452	1954	1720	1815	1644
Mercer County													
Mining	738	748	714	748	447	463	266	215	259	265	117	112	167
Manufacturing	2439	2442	2204	2173	1874	2092	1984	1668	1763	1811	1816	1979	2004
Transportation	2690	2751	2635	2576	2440	2382	2314	2275	2247	2219	2049	2091	2072
Government	3299	3443	4179	4296	4450	4491	4558	4617	4593	4728	4636	4627	4671
Retail Trade	5503	5603	5854	5663	5540	5479	5526	5771	5808	5776	5885	5999	6086
Services	6335	6433	5813	6279	6250	6331	6418	6417	6382	6486	6580	6864	7233
Tazewell County													
Transportation	266	196	182	197	199	232	279	272	259	278	349	427	468
Mining	2464	2227	2141	1884	975	1053	889	937	706	950	980	887	886
Manufacturing	2431	2322	2225	2245	1654	1345	1582	1430	1300	1395	2017	2004	2034
Services	1803	1924	2059	2236	2209	2349	2498	2534	2383	2540	2554	2807	2872
Government	2391	2453	2503	2299	2419	2371	2438	2701	2595	2698	2689	2805	2778
Retail Trade	2516	2591	2596	2850	2781	2818	3094	3212	3378	3231	3233	3258	3242

In Wyoming County, employment trends seem to be similar to those in McDowell County; mining has experienced a decline in employment, while the other sectors have remained relatively steady with slight increases, but not enough to absorb unemployment from the mining sector.

Mining is not as important in Mercer County as in the other study area counties. The service industry is the largest employer in Mercer County. Both the service industry and retail trade have steadily increased over the past 20 years. In contrast, manufacturing and transportation have decreased over time, paralleling total employment.

In Tazewell County, the economy appears relatively diversified. Mining employment has had overall decreases, but services and retail trade employment has grown steadily. In addition, manufacturing has fluctuated but is still a major employer in the county.

In summary, total employment has decreased for all counties in the study area. The employment in Mercer and Logan counties has shifted to other sectors as the coal industry employment has decreased; however, in Wyoming and McDowell counties, mining employment decreased by over 70 percent with no appreciable increase in employment in other sectors.

Farming does not play a large role in the economy. The contribution of farming to personal income is less than one percent in all study area counties.

3.1.6 ENVIRONMENTAL JUSTICE

Presidential Executive Order 12898 on Environmental Justice states that disproportionately high and adverse human health or environmental effects to low-income and minority populations must be identified and taken into consideration for federal projects.

Low-income groups are defined as people "whose household income is below the Department of Health and Human Services poverty guidelines" (USDOT, 1995). Additionally, for this project, low-income populations include people that receive public assistance income such as transfer payments.

The 1990 U. S. Census divides the population into five categories: American Indian/Eskimo/Aleut, Asian/Pacific Islander, Black, Other, and White. All categories except White were combined to form the minority population.

The affected environment for environmental justice is established through a combination of census data, a series of public workshops held in May of 1998, and the results of a street-corner survey conducted in communities throughout the study area. Both the street-corner survey and public workshops were mechanisms for better determining the distribution of environmental justice populations, as the census data is aggregated at very large geographic levels in rural areas such as the study corridor. Relevant results of the street-corner survey are noted, rather than presenting detailed results of the survey, as a means of protecting the privacy of study corridor residents.

3.1.6.1 Low Income Populations

Poverty statistics from the U.S. Census are based on "the standard to be used by federal agencies for statistical purposes" (U.S. Department of Commerce, 1992a). Originally, the U.S. Department of Agriculture determined that a typical family of three spent one-third of their income on food. Thus, the poverty level was set at three times the cost of a government economy food plan. This has been adjusted over time and can be adjusted for family size (U.S. Department of Commerce, 1992a and 1992b). The average poverty threshold for a family of four in the United States in 1990 was $12,674. Within the study area, more individuals and families were in poverty in 1990 than in 1980 (Table III-8).

In the West Virginia counties of the study area, the percentage of the population in poverty is higher than the state percentage. Table III-8 also shows that the total number of families in West Virginia decreased between 1980 and 1990, but the percentage of families in poverty has increased in all West Virginia study area counties. The percent of individuals and families in poverty in Virginia decreased between 1980 and 1990. However, within Tazewell County these percentages have increased.

Within the study area there are several communities where the poverty rate of the local population exceeds the average poverty rate of the respective counties. Table III-9 identifies these communities and the percentage of the population in poverty for 1990.

TABLE III-8
POVERTY STATUS

County	Percent of Population in Poverty		
	1980	1990	Percent Change
Mingo, WV	23.6%	30.7%	23.1%
Logan, WV	16.6%	27.7%	40.8%
McDowell, WV	23.5%	37.5%	37.3%
Wyoming, WV	19.3%	27.8%	30.5%
Mercer, WV	15.1%	19.9%	24.1%
Tazewell, VA	14.1%	19.0%	25.7%
Study Area	18.2%	25.8%	29.4%
West Virginia	15.0%	19.2%	21.8%
Virginia	11.8%	10.2%	-15.6%

County	Percent of Families in Poverty		Percent Change	
	1980	1990	Families in Poverty	Total Number of Families
Mingo, WV	20.5%	28.3%	27.5%	-4.6%
Logan, WV	14.4%	24.3%	40.7%	-12.0%
McDowell, WV	19.3%	33.7%	42.7%	-25.2%
Wyoming, WV	16.3%	24.1%	32.3%	-14.6%
Mercer, WV	11.7%	16.8%	30.3%	-9.9%
Tazewell, VA	12.2%	16.9%	27.8%	-4.5%
Study Area	15.1%	22.7%	33.4%	-11.7%
West Virginia	11.7%	16.1%	27.3%	-5.8%
Virginia	9.20%	7.76%	-18.5%	16.0%

Sources: U.S. Department of Commerce, 1980, 1992a, and 1992b.

TABLE III-9
LOW-INCOME POPULATIONS WITHIN THE STUDY AREA

County	Community	Percent of Persons in Poverty
Mingo, WV	Delbarton	41.6%
	Red Jacket	41.4%
McDowell, WV	Davy	45.4%
	Keystone	48.4%
	Kimball	40.5%
	Northfork	49.7%
Mercer, WV	Bramwell	25.9%
	Montcalm	39.8%

Source: U.S. Department of Commerce, 1992a and 1992b.

The percentage of households receiving public assistance income in the form of transfer payments (non-wage or salary income) varies over the study area; all counties had a higher percentage of households receiving public assistance than their respective state's percentages in 1990 than in 1980 (Table III-10). For all study area counties, the total number of households with public assistance has increased. However, in both 1980 and 1990, McDowell and Mingo counties had a higher percentage than the remainder of the counties. Wyoming County also experienced a large increase in the number of families receiving public assistance.

TABLE III-10
HOUSEHOLDS RECEIVING PUBLIC ASSISTANCE

County	Percent of All Households		Percent Change
	1980	1990	
Mingo, WV	15.5%	17.6%	11.91%
Logan, WV	10.8%	14.3%	24.4%
McDowell, WV	15.7%	19.7%	20.3%
Mercer, WV	9.40%	9.90%	5.0%
Wyoming, WV	10.3%	14.3%	27.9%
Tazewell, VA	7.7%	8.7%	11.4%
West Virginia	8.70%	9.70%	10.3%
Virginia	6.6%	5.4%	-22.2%

Sources: U.S. Department of Commerce, 1980, 1992a, and 1992b.

The street-corner survey results confirm that much of the study area is comprised of low-income residents. Most of the respondents who identified their communities as containing low-income residents indicated that those residents were spread throughout the communities.

3.1.6.2 Minority Populations

Minority populations in West Virginia and Virginia comprise less than 25 percent of the total population within each State (Table III-11). The minority populations for West Virginia and Virginia in 1990 were 3.8 percent and 22.6 percent, respectively. Population statistics for 1990 show that 94.6 percent of the population in the study area was white and 5.4 percent of the population consisted of minorities. Minority populations in the study area counties has decreased between 1980 and 1990, with the exception of Tazewell County. The percent of minorities in the study area counties in 1990 range from approximately 1.2 percent (Wyoming) to 13.6 percent (McDowell).

TABLE III-11
MINORITY POPULATIONS WITHIN STUDY AREA COUNTIES

County	Percent Minority 1980	Percent Minority 1990	Percent Change
Mingo, WV	3.1%	2.6%	-19.2%
Logan, WV	4.5%	3.9%	-15.3%
McDowell, WV	15.0%	13.6%	-10.3%
Wyoming, WV	1.4%	1.2%	-16.6%
Mercer, WV	7.4%	6.7%	-10.4%
Tazewell, VA	3.0%	3.1%	3.22%
West Virginia	3.8%	3.8%	0.0%
Virginia	20.8%	22.6%	7.9%

Sources: U.S. Department of Commerce, 1980, 1992a, and 1992b.

McDowell County has the highest minority population in the study area. Minority communities in McDowell County are located along US 52 (study route) in Northfork, Welch, Keystone, and Kimball. Other minority populations within the study area are located in Williamson (Mingo County), Bramwell (Mercer County), and Bluefield (Mercer County). Table III-12 shows the percentage of these minority populations within each community in 1990.

The street-corner survey results confirm that minority populations are generally sparse within the study area, with the exception of eastern McDowell County. Most of the respondents who identified their communities as containing minorities indicated that those residents were spread throughout the communities. Respondents in four communities -- Williamson, Iaeger, Welch and Bluefield -- identified particular locations where minority families are concentrated.

TABLE III-12
MINORITY POPULATIONS WITHIN STUDY AREA COMMUNITIES

County	Community	Percent of Minority Population
Mingo, WV	Williamson	15.9%
McDowell, WV	Keystone	61.6%
	Kimball	70.7%
	Northfork	59.7%
	Welch	18.0%
Mercer, WV	Bramwell	14.8%
	Bluefield	23.9%

Source: U.S. Department of Commerce, 1992a and 1992b.

3.1.7 FARMLANDS

According to the FHWA, farmland soils include: prime soils, unique soils, and soils other than prime or unique that are of state-wide or local importance (USDOT, 1987). In accordance with the Farmland Protection Policy Act (FPPA) (Subtitle I of Title XV, Agriculture and Food Act, 1981) the criteria for determining prime, unique, state-wide important, and locally important farmlands are soil type, slope, texture, quality, location, and moisture availability.

Within each state, U.S. Department of Agriculture - Natural Resources Conservation Service (NRCS) district conservationists are responsible for determining which soils are classified under the four farmland types. Soils classified as farmland are afforded protection under the FPPA. The farmland soil types appear in Table III-13 by county.

3.1.7.1 Soils

Prime farmland soils and state-wide important soils are limited in Mingo, Logan, Wyoming, and McDowell counties because of the steep terrain. Because steep terrain also limits development, many farmland soils have been altered or removed by residential and commercial facilities. In Mercer County, West Virginia and Tazewell County, Virginia, the topography is more favorable to prime, unique, state-wide important, and locally important soils.

3.1.7.2 Farms

According to the U.S. Census of Agriculture, there are nine farms in both McDowell and Mingo counties, 58 farms in Wyoming County, and 495 farms in Mercer County (Center for Economic Research, 1994). The farms in the study area counties produce livestock, primarily cattle, and hay/alfalfa/silage type crops.

TABLE III-13
FARMLAND SOIL TYPES WITHIN STUDY AREA COUNTIES

County	Prime Farmland Soils	State-Wide Important Farmland Soils
Logan and Mingo, WV *	Allegheny loam, Chavies fine sandy loam, Chagrin loam, Sensabaugh	Craigsville vgrsl, Yeager fine sandy loam, Lobdell
McDowell, WV	Chavies (Cv)	Lily loam (LlC), Yeager (Ye)
Wyoming, WV	ChagrinRF (Cv), Chagrin (Ch)	Monongahela (MgB), Gilpin-Lily (GpC), Pineville-Buchanan (PbC), Lobdell (Ho)
Mercer, WV	Gilpin sil (GaB), Kanawha fsl (Ka), Lily loam (Llb), Shouns sil (ShB), Chagrin loam (Cm), Lobdell loam (Lo)	Calvin (CaC, CaD), Calvin-Berks (CbC, CbC3, CbD), Clymer-Gilpin (CnD), Coolville-Latham (CtC, CtD), Dekalb (DeC, DeD), Ernest (ErB, ErC, ErD), Frederick (FkC, FrC, FrD), Gilpin (GaC, GaD), Gilpin-Berks (GbC, GbC3, GbD), Lily (LlC, LlD), Monongahela (MgB, MgC), Murrill (MuC, MuD), Shouns (ShC, ShD), Tilsit (TtB), Westmoreland WeC, WeD)
Tazewell, VA	Allegheny (1A, 1B), Coursey (17B), Frederick (20B, 21B, 22B), Groseclose (26B), Guernsey (27B), Melvin (32A), Murrill (34B), Newark-Lindside (35A), Philo (41A), Pisgah (42B, 43B), Pope (45A), Purdy (47A), Timberville (48B), Wolfgap (54)	N/A

Sources: USDA, 1988 and 1984.
Note: There are no farmland soils in Mingo County. Farmland soils were available for Tazewell County; the soil survey is as yet unpublished.
* Farmland soils information for Logan County is preliminary and may be subject to future change.

3.1.8 RECREATIONAL RESOURCES

The recreational resources throughout the region of southern West Virginia surrounding the study area appear in Exhibit III-4. Table III-14 lists the recreational resources and their facilities for the region, along with the 1990 visitation rates for each resource.

The study area counties also have historical and cultural resources to offer, including historic districts located in Bluefield and Bramwell, and proposed coal heritage towns located throughout the region. Bluefield, the Mercer County seat, has resources to offer including the Eastern Regional Coal Archives, a cultural center, an historic district, and the Science Center of West Virginia. Bramwell, located north of Bluefield on US 52, is also known for its historic district as well as its historical significance in the area's coal history. In addition, there is a proposed Bluestone Junction Tourist Railroad to run along Widemouth Creek and the Bluestone River.

TABLE III-14
RECREATIONAL RESOURCES

Recreational Resources	Visitation in 1990-91	Hiking	Camping	Fishing	Hunting	Swimming	Picnicking	Whitewater/ Boating	Scenic Overlooks	Golf	Tennis	Lodge	Cottages
Within the Study Area													
Pinnacle Rock State Park	98,970	X		x			x		x				
Glenwood Recreational Park	n/a						x	x		x	x		
R.D. Bailey Lake and WMA	300,000	X	x	x	x		x	x	x				
Within the Region of Southern West Virginia													
Laurel Lake WMA	117,475	X	x	x	x	x	x						
Panther State Forest	29,663	X	x	x	x	x	x						
Berwind Lake WMA	20,455	X		x	x	x	x	x					
Anawalt WMA	n/a			x	x			x					
Pipestem Resort State Park	809,971	X	x	x		x	x		x	x	x	x	x
Camp Creek State Park and Forest	72,316	X	x	x	x								
Horse Creek WMA	n/a			x	x								
Twin Falls State Park	521,889	X	x			x	x		x	x		x	x
Bluestone Lake and WMA	186,088	X		x	x		x	x					
Bluestone Scenic River	n/a	X						x					
Bluestone State Park	517,062	X	x	x		x	x	x					x
Chief Logan State Park	639,065	X	x	x		x	x						
Appalachian National Scenic Trail	n/a	X	x						x				

Sources: Bell Atlantic, 1994; Delorme Mapping Company, 1989; West Virginia Travel Department, 1994; U.S. Army Corps of Engineers, 1994; West Virginia Park Office, 1995.
Note: WMA = Wildlife Management Area n/a=not available

In Mingo County, a large portion of the county's recreational resources relate to coal heritage. The town of Matewan has mobilized an extensive revitalization effort focusing on the historical and cultural resources of the town and the region. Much of the impetus for this came from the town's community development program as well as the 1987 John Sayles film *Matewan*. Currently, there are proposals for a variety of recreational resources in the area including:

- The Tug Valley Greenway, with potential facilities for hiking, biking, camping, fishing access, and scenic overlooks along the Tug River south of Matewan.
- Recognition and preservation of resources related to the Hatfield and McCoy feud.
- The proposed Hatfield and McCoy Trails System for motorized and non-motorized traffic.

In addition, there are several recognized historical sites relating to the historic importance of the coal industry in Wyoming, McDowell, Mingo, and Mercer counties, West Virginia. Currently in the proposal stage, coal heritage towns, with resources relating to the importance of coal in the region and a scenic Miner's March Trail to be designated along existing roadways - which would link coal related resources, especially surrounding the Coal Mine Wars of 1919-1922, would add to the diversity of recreational resources in the area. Coal heritage towns were chosen based on their physical condition, location, and history and coal heritage. Brochures and maps highlighting resources relating to coal heritage in "Coal Country" (Wyoming, McDowell, Mingo, Logan, and Boone counties) have been developed. In many southern West Virginia counties, coal heritage has become the focal point of a local/regional concentration on the promotion of tourism, which itself has become an important contribution to the West Virginia economy.

3.1.9 CULTURAL RESOURCES

Cultural resources may be generally defined as the patterned physical remains of human activity distributed over the landscape through time. Specifically, cultural resources can range in complexity from individual objects to entire cities. Findings within the *King Coal Highway Cultural Resource Appendix (Volume II)* are classified as historic resources and archaeological sites. Examples of these cultural resources include buildings, cemeteries, railroads, industrial complexes, and prehistoric Native American archaeological sites.

Several cultural and architectural resource surveys have been completed within the study area over the last 15 years (e.g. Coal Heritage Survey, Shawnee Parkway/King Coal Highway Feasibility Study, and West Virginia Bridge Inventory). These surveys have identified mostly historic buildings that are directly linked to the coal industry (*Volume II: Cultural Resource Appendix*). The following is a summary of the types of historic resources and archaeological sites identified within the Build Alternatives.

3.1.9.1 Historic Resources

Most of the previously recorded architectural resources more than 50 years old were identified as part of the multi-county Coal Heritage Survey in southern West Virginia. Many of these properties and the majority of uninventoried resources identified as part of the current study represent late nineteenth through mid twentieth-century coal and coke-related resources such as mining communities, residences, churches, commercial buildings, transportation facilities, etc. The presence of these resources reflects the major influence of the coal industry on the social and economic development of the study area and its landscape. The influence of other industries such as lumber mills, services, and the railroad are also reflected in the study area, but to a lesser degree.

Specific resources evaluated for this study are detailed in: a) Cultural Resource Appendix (Volume II). This appendix presents the results of a cultural resource investigation undertaken as part of alternative selection process for the proposed King Coal Highway; b) The Final Determination of Eligibility for Cultural Resources. This report included determinations of eligibility for all potential historic resources within the APE for the Preferred Alternative; c) Final Assessment of Adverse Effects for Historic Properties in the Preferred Alternative.

Pursuant to the provisions of 40 C.F.R. 1502.1, these materials are incorporated by reference into this FEIS. The FHWA will make these materials available for inspection by interested parties.

Settlement-Related Resources

Settlement in the region began in the late eighteenth and early nineteenth centuries (Rice, 1985). During this period, houses built of hand-hewn logs were constructed in the Midland log forms (McAlester and McAlester, 1993). The log walls were chinked with locally available mud and stone, and the roofs were clad in split-wood shingles or shakes. Barns and auxiliary buildings were also constructed of log. Very few commercial enterprises existed then, as most settlers were largely subsistence farmers. No buildings of the earliest settlement period have been identified in the Build Alternatives, though it is possible that they may exist in radically altered condition.

Coal-Related Resources

The layout for the coal towns was planned to accommodate the mine operations. Mine complexes were designed to connect mines to rail lines. Coke ovens were usually placed along a hillside near the rail lines, and other necessary mine structures such as the conveyors, tipples, water tanks, and field offices were located on any level ground adjacent to the mine (Morris, 1950).

Coal industry-related worker housing was financed, designed, and constructed by individual coal companies using a small set of materials and plans (Eller 1982). Rows of like-designed houses, closely spaced and sometimes two or three deep, are located in groups throughout the coal towns. Examples of worker housing in the coal mining communities within the Build Alternatives generally illustrate nationally recognized dwelling forms such as the Gable-Front, Hall & Parlor, I-House, Gable-Front-&-Wing, and Pyramidal forms (McAlester and McAlester, 1992). A typical worker house in the Build Alternatives is constructed of frame on a stone or concrete block foundation. The foundation may be continuous or a system of piers. The exterior of the house is clad with weatherboard siding. The front facade usually features a porch, though a rear porch also may be present. In the coal towns within the Build Alternatives, a limited variety of dwelling forms are illustrated by worker housing, and stylistically-influenced architectural details are rare.

Residences built for company operators and managers are larger and exhibit more stylistically-influenced architectural detail than those constructed for workers. These houses were constructed on larger building sites located either high up on a hill overlooking the community, or at the opposite end of town from the mine. These locations allowed them to avoid the noise and dust generated by the mining operations (Morris, 1950). The homes built for the wealthier members of the coal communities exhibit a variety of architectural styles including the Queen Anne, Italianate, Tudor Revival, Colonial Revival, and Moderne styles.

The company stores, schools, and offices are centrally located in the coal towns. They are most often two to four stories high and constructed of brick or cut stone. The company stores in the Build Alternatives are of monumental scale with unique design influences from the Classical Revival and Modern Movement. The schools in the Build Alternatives are constructed of brick and are generally one to three stories high. They exhibit a variety of architectural influences including Neoclassical Revival and Collegiate Revival. Commercial buildings are built in either the one-part or two-part plan with decorative elements including brick and stone work, detailed cornice lines, arched entries, and detailed window and door surrounds.

Three commercial buildings have been identified within the Build Alternatives. One commercial building, the Bowen Booth company store (Mc221), is a two-story, frame building with clapboard siding. It features a false facade with paired front windows, a central entry, and an open second-floor balcony (Dobson et al. 1991). The second building (Mc514) located in the Build Alternatives consists of a two-story, two-bay building with brick and clapboard siding and a sloping roof (Dobson et al. 1991). A third building is the Pure Oil Gas Station on US 52 in Simmons, which was built in the Tudor Revival style in 1938.

Each coal town in the Build Alternatives generally had at least two churches in which the citizens in the community could worship (Eller, 1982). A typical church building is one and one-half story in scale and constructed of frame. Its front gable roof often incorporates a bell tower near the front facade. A double-door entry with a pedimented surround and lancet-arch windows are common details for a typical church in the Build Alternatives. Three churches have been identified within the Build Alternatives. The United Methodist Church of Freeman (Mc220), the Bluewell Church (Mc509), and the Elizabeth Bowen Jones United Methodist Church (BAHD 328). The Freeman and Bluewell churches are one and one-half story, gable front, frame buildings with concrete block foundations, clapboard siding, arched windows, and a full-height entry. The church in Freeman has a two-story gable-end bell tower, and the church is Bluewell has a cupola at the gable-end housing a bell loft. However, the fenestration pattern on the Bluewell church has been altered, and the building has been clad in aluminum siding. The Elizabeth Bowen Jones United Methodist Church was built ca. 1905 in the Romanesque Revival style (Gioulis, 1995: 26).

A limited number of coal mining structures (tipples, conveyors, etc.) are located in the Build Alternatives. An in-depth context will be presented with future determinations of eligibility evaluations of these structures if they are located within the APE for the King Coal Highway project.

Timber-Related Resources

Extraction of the region's vast timber resources on a commercial scale was hampered by the terrain and lack of adequate means to transport the lumber to population centers until the latter part of the nineteenth century. Early nineteenth-century commercial lumber mills used water power to produce a limited output of wood products. But a growing population's demand for lumber led to the construction of very productive steam-powered band and circular saw mills throughout the region in the late 1800s (Clarkson, 1964).

Some of the timbering facilities were expansive, complex operations that relied on extensive transportation networks to service the mills and surrounding communities. Several lumber companies constructed towns to accommodate their workers. These company towns typically included worker housing, schools, boarding houses, churches, recreation buildings, and company stores. Most of the houses were wood frame buildings with vertical board and batten siding, grouped together in rows (Clarkson, 1964). These houses, like coal town worker houses, lack details illustrating architectural styles.

Small operations of a more temporary nature were common in many of the minor valleys within the Build Alternatives. Logging camps were constructed near these smaller mills. The majority of these camps consisted of a single, frame, two-story building used for both housing and feeding the workers and maintaining operations. Many of the early lumber mill towns in the area of the Build Alternatives were abandoned in the 1920s due to the depletion of nearby merchantable timber and a fluctuating market (Eller, 1982). Although the timber industry in and around the study region prospered during the 1890s to the 1920s, no historic resources directly associated with the timber industry have been identified within the Build Alternatives.

Service and Rail-Related Resources

Whereas some communities depended solely on either the coal or timber industry, the economies of other towns were enhanced by service and railroad industries. Service and rail communities in the Build Alternatives (e.g., Bluefield) differ from coal communities in layout, with the rail lines and topography, rather than coal mines, determining the commercial center and housing layout. As in the coal communities, railroad worker housing tends to be clustered, and constructed of prefabricated materials; the homes of wealthier residents are larger and exhibit more stylistic architectural detail. The churches and schools within the service and rail communities are generally similar in architectural form and detail as those in the coal towns.

Commercial buildings in the rail and service communities, such as churches and schools, are also similar in design to those in the coal towns, but are greater in number. In Williamson, the Mingo County seat, and Bluefield the commercial and civic buildings are built in a planned city block pattern. Banks, large department stores, hotels, and public buildings, such as the courthouse and post office, were often designed in the Romanesque and Renaissance Revival styles.

Vernacular Architectural Forms

The workers' housing in the communities within the Build Alternatives generally reflect vernacular construction traditions similar to the National Gable-Front, Hall & Parlor, I-House, Gable-Front-&-Wing, and Pyramidal (McAlester and McAlester, 1993). The majority of these houses are of wood-frame construction built on either stone or concrete block foundations or stone piers, and clad in either clapboard or shiplap siding. Following are discussions of the types of vernacular architectural forms represented by the previously recorded residences within the King Coal Highway Build Alternatives.

One vernacular form is a two-story, gable-front, frame house with clapboard siding, and an interior chimney, exemplified by Mc513. Another vernacular form within the Build Alternatives is a side-gabled, frame house, either one or two stories in height. These houses generally have clapboard siding and interior chimneys at the gable ends. Double-hung sash windows, which in some examples have stone or brick lintels and sills, are common. Most examples of this variety have front, side, and/or rear porches with either hipped or shed roofs supported by square posts. Two previously recorded examples of this type have a saltbox shape. One example, Mc507, is constructed of stone.

A third vernacular form is the gable and wing, frame house. These houses generally have either clapboard or German siding and exterior brick chimneys. Most of the examples have either open or enclosed, two-story porches within the corner ell. Many also have additional one-story, full-length or wrap-around porches.

The cross-gable, frame house, either one or two stories in height, is another vernacular form found within the Build Alternatives. A few examples have a pedimented front gable. Most examples have wide returns, one-story hip or wrap-around porches, and interior chimneys.

Another vernacular form is the one or two-story pyramidal house, of frame or brick construction. The frame examples generally have clapboard siding. Interior chimneys and front porches are common. Architectural details associated with this form include stone lintels, sills, and quoin details, as well as side lights around the central door.

Examples of bungalows are also found within the Build Alternatives. Two examples are one-story, end-gable, brick houses. A third example, BAHD 317, is a one and one-half-story, side-gable residence with aluminum siding. Extended rafter ends, gable dormers, multiple roof planes, and triangular braced supports characterized the bungalow (McAlester and McAlester, 1993).

3.1.9.2 Archaeological Sites

There is limited information on archaeological sites within the Build Alternatives. In the study area region, evidence suggesting the occupation of the area by aboriginal (Native American) groups during the Paleo-Indian (15000-8500 B.C.), Early Archaic (8500 - 6000 B.C.), Middle Archaic (6000 - 4000 B.C.), Late Archaic (4000 - 1000 B.C.), Late Woodland (A.D. 400 - 1000), and Late Prehistoric (A.D. 1000 - 1580) periods has been found during archaeological site investigations for unrelated projects (*King Coal Highway Cultural Resource Appendix (Volume II)*). Features and artifacts from these prehistoric archaeological sites include petroglyphs, projectile point/knife forms, lithic debitage, and pottery sherds.

Because the number of recorded archaeological sites in the general study region is limited, a computer-based Prehistoric Predictive Model was developed as a means to identify areas of high to low probability for the presence of prehistoric sites within the Build Alternatives. The model results suggest that the areas of highest probability for prehistoric archaeological sites are flat locales adjacent to large fifth- through seventh-order streams, particularly near major stream confluences. Similar areas adjacent to smaller second-order streams are also high probability areas. Flat ridge tops and saddles are high to moderate probability areas, particularly near ridge top intersections. The areas least likely to contain archaeological resources are steep hillsides, distant from water, regardless of nearest stream size.

The results of the Predictive Model indicate a very wide difference between the types of prehistoric sites found in the New River/Clinch River valleys versus the sites found in the Tug Fork/Levisa Fork/Guyandotte/Big Coal River valleys. This difference results from the presence of two distinct environments and two different patterns of utilizing those environments.

The sites known from the New River/Clinch River valleys tend to be more closely tied to large rivers and lowland ecosystems, with a relatively infrequent usage of upland locales (hilltops, ridges, and high order terraces). Movement from one area to another may have been accomplished more frequently by following rivers rather than ridge tops. The sites associated with the New River/Clinch River valleys tend to be larger and more continuously occupied.

In contrast, the sites known from the Tug - Coal River watersheds are more frequently found in upland settings, though some more permanent habitation sites occur in lowland valleys. The overall trend indicates that prehistoric people did not spend long periods of time in the region, and when they did, they tended to be camping on ridge tops.

Historic-period archaeological sites recorded in and around the study area have typically included field clearing rock piles, building foundations, and cemeteries. Recovered artifacts have included such items as historic ceramics, glass, metal, and cinders.

Predictability models, like the computer-based model developed for prehistoric sites in the Build Alternatives, are less useful for proposing historic site locations, as historic patterns of settlement are not generally driven purely by ecological factors, but by a medley of cultural and environmental conditions. The locations of potential historic site loci are generally based on the use of historic mapping and other documentary and informant data, as well as the archaeological and architectural inventory files maintained at the State Historic Preservation Offices (SHPO).

3.2 NATURAL ENVIRONMENT

3.2.1 SURFACE WATER RESOURCES

Surface water resources within the study area are limited to steep trapezoidal first, second, and third order stream systems (with the exception of the Bluestone River) which empty into larger river systems (e.g. Guyandotte, Tug Fork, Big Sandy, New). Additionally, there are man-made ponds, reservoirs, and sedimentation ponds. Three watersheds which include the Upper New River watershed; Tug Fork watershed; and Guyandotte River watershed are located within the study area (Exhibit III-5). The following is a summary of general characteristics of each major watershed and primary surface water resources identified within the Build Alternatives.

3.2.1.1 Upper New River Watershed (Bluestone River/East River Sub-basins)

The Upper New River watershed is situated in three physiographic provinces: the Blue Ridge; Ridge and Valley; and Appalachian Plateau. The study area lies wholly within the Appalachian Plateau physiographic province and, specifically, within the East River and Bluestone River sub-basins of southern West Virginia. The Upper New

River watershed, as a whole, includes parts of Fayette, Monroe, Raleigh, and Summers counties, and all of Mercer County, West Virginia and drains approximately 3818 square kilometers (1,474 square miles) or 6% of West Virginia. In general, the water quality of the Upper New River watershed (Bluestone River and East River sub-basins) can be characterized as good (WVDNR, 1983). However, the disposal of domestic sewage and agricultural runoff have been identified as primary sources of pollution (fecal coliform levels above State Water Quality Standards) within West Virginia. Other sources of pollution include acid drainage, chemicals, and sedimentation. Coal mining (both stripped and subsurface) accounts for acid drainage within the watershed. Oil and gas extraction, industry, and logging contribute to chemical and sediment loads within the watershed.

Within the study area for the East River and Bluestone River sub-basins, ponds and lacustrine surface waters are limited to small man-made reservoirs and sedimentation ponds for coal mining. Many of these aquatic systems are devoid of life and exist solely for the capture and retention of coal fines and other sediment particles associated with mining and other construction-related activities.

In the East River sub-basin, major streams and tributaries within the study area include the East River and Dam Hollow near Bluefield, Virginia.

The majority of the study area within the Upper New River watershed is within the Bluestone River sub-basin. The Bluestone River is one of the larger tributaries to the New River. The river is situated immediately north of the East River, and flows generally northeastward from where it originates (the north slope of East River Mountain). The river is approximately 124 kilometers (77 miles) in length, possessing distinct meanders with few major tributaries. The total drainage area of the sub-basin is approximately 1196 square kilometers (462 square miles).

Coal mining is the main industry within the Bluestone River sub-basin. Human/animal waste and coal mining have been identified as the major limiting factors to water quality within this sub-basin. However, the Bluestone River sub-basin is also well known for its recreational value. The lower eight kilometers (five miles) of the Bluestone River are within Bluestone State Park and Bluestone Wildlife Management Area. Only Pinnacle Rock State Park is within the study area. However, no stocked or published native trout streams are identified within Pinnacle Rock State Park.

Major streams and tributaries within the study area of the Upper New River watershed include Bablin Hollow, Beaverpond Creek, Bluestone River, Brush Fork, Buckeye Hollow, Butt Hollow, Crane Creek, Edison Hollow, Godfrey Branch, Jones Dam Hollow, Lefthand Fork, Lorton Lick Creek, Middle Fork, Mill Creek, North Fork, Perdue Hollow, Sandlick Creek, Simmons Creek, South Fork, and West Fork Hollow.

3.2.1.2 Guyandotte River Watershed

The Guyandotte River watershed covers approximately 4351 square kilometers (1,680 square miles) in the Appalachian Plateau physiographic province (Fenneman and Johnson, 1946) of southern West Virginia. In general, the Guyandotte River watershed is subject to a number of natural and man-induced pollutants and disturbances that limit water quality and use. Major problems and concerns in the Guyandotte River watershed include flooding, erosion, abandoned mines, mine dumps, agricultural runoff, uncontrolled wildfires, and poor forest management (WVDNR, 1988). The Guyandotte River possesses poor water quality in many locations as a result of raw sewage, pollutants from mine lands, and during low flow conditions low pH and dissolved oxygen levels.

Ponds and lacustrine surface waters within the study area are limited to small man-made reservoirs and sedimentation ponds for coal mining. One exception to this is R.D. Bailey Dam, which is a U.S. Army Corps of Engineers dam built in 1980 to control catastrophic flooding. The dam also provides extensive aquatic habitat for wildlife and recreational opportunities in a region where lakes are uncommon. R.D. Bailey Lake is located near the town of Justice, in Wyoming County. Immediately downstream of the dam outlet, the Guyandotte River is stocked with trout.

Major streams and tributaries of the Guyandotte River watershed within the study area include Browning Fork, Coon Branch, Donaldson Branch, Gap Branch, Garden Gap Branch, Gilbert Creek, Guyandotte River, Horsepen Creek, Ikes Fork, Island Creek, Kezee Branch, Little Buzzard Branch, Little Cub Creek, Little Huff Creek, Little Pinnacle Creek, Lizard Creek, Lower Pete Branch, Marsh Fork, Muzzle Creek, Nelson Branch, North Spring Branch, Oldhouse Branch, Pad Fork, Perry Branch, Pinnacle Creek, Right Fork Muzzle Creek, Righthand Fork, Rock Branch, Rose Branch, Sharkey Branch, Skillet Creek, Smith Branch, Switchback Hollow, Turkeywallow Branch, Upper Pete Branch, and White Oak Branch.

3.2.1.3 Tug Fork Watershed

The Tug Fork watershed includes approximately 4040 square kilometers (1,560 square miles) in the Appalachian Plateau physiographic province in southern West Virginia, eastern Kentucky, and western Virginia. The watershed is primarily forested and mountainous (Bader et al., 1989).

Coal production is the major industry within this watershed. Surface and deep bed mining have significantly affected this watershed by altering hydrology, accelerating erosion and sedimentation, discharging metals, and reducing water quality and aquatic habitat as a result of acid drainage. In addition, the accumulation of coal refuse and waste is a chronic problem within this watershed. The exploration of gas and oil in the past and present also impact this watershed as a result of improperly sealed wells.

Seasonal flash flooding of the Tug Fork and its associated tributaries is a major problem within this watershed. The primary causes of flooding are a lack of vegetation on steep mountainous slopes, saturated soils, snow cover, and the formation of quasi-stationary fronts that produce large storm events which can persist for several days (Bader et al., 1989).

Stream water quality varies seasonally with streamflow. In general, the Tug Fork exhibits high levels of suspended solids, dissolved solids, sodium, sulfate, iron, manganese, fecal coliform, and fecal streptococci. It is believed that elevated levels of many of these parameters is the result of mining, gas and oil exploration (brine contamination), and human waste. However, the Tug Fork also exhibits acceptable dissolved oxygen concentrations, water temperature, neutral to alkaline pH, high alkalinity, and low trace metal contamination. In general, the Tug Fork is a valued fishery according to state resource personnel. Despite the presence of raw sewage, high siltation, and garbage, the river is recovering. One tributary in particular, Elkhorn Creek, is known to possess hold-over rainbow trout (*Oncorhynchus mykiss*) due to an underground spring that provides cool consistent water temperatures.

In the Tug Fork watershed, ponds and lacustrine surface waters within the study area are limited to small man-made reservoirs and sedimentation ponds for coal mining and other construction activities. Many of these aquatic systems are devoid of life and exist solely for the capture and retention of coal fines and other sediments associated with mining and other construction-related activities. Within the study area, many of these sedimentation ponds that are located on small first- and second-order tributaries to the Tug Fork, were observed to be full and in poor working condition. Thus, during storm events, sediments are washed downstream into receiving streams and ultimately to the Tug Fork.

Major streams and tributaries of the Tug Fork watershed within the study area include Angle Hollow, Badway Branch, Barlow Hollow, Ben Creek, Big Branch, Big Muncy Branch, Bird Branch, Bottom Creek, Buffalo Creek, Buzzard Branch, Cabin Fork, Clear Fork, Conley Branch, Coontree Branch, Davy Branch, Dry Branch, Elkhorn Creek, Evans Ferrell Branch, Grant Branch, Harman Fork, Hell Creek, Hensley Branch, Honeycamp Branch, Johnnycake Branch, Johns Knob Branch, Laurel Branch, Laurel Fork, Left Fork Ben Creek, Left Fork Davy Branch, Lick Branch, Little Daycamp Branch, Little Fork, Little Indian Creek, Little Laurel Branch, Little Muncy Branch, Longtail Lick Branch, Mate Creek, Meador Branch, Miller Creek, Millstone Branch, Moorecamp Branch, Newson Branch, Nighway Branch, North Fork Elkhorn Creek, Oldfield Branch, Pigeon Creek, Pigeonroost Creek, Puncheoncamp Branch, Riffe Branch, River Laurel Branch, Rockhouse Fork, Rover Branch, Ruth Trace Branch, Sandy Huff Branch, Shabbyroom Branch, Shannon Branch, Slick Rock Branch, South Fork Buffalo Creek, Spice Branch, Spice Laurel Branch, Stonecoal Branch, Sugartree Creek, Thacker Fork, Trace Branch, Trace Fork, Trail Fork, Tug Fork, Twin Branch, Upper Belcher Branch, White Oak Hollow, and Windmill Gap Branch.

3.2.2 WETLANDS

Wetlands are defined by the U.S. Environmental Protection Agency (USEPA) and U.S. Army Corps of Engineers (COE) as: "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." (USEPA 40 CFR 230.3 and COE 33 CFR 328.3).

The most current comprehensive estimate of wetlands in West Virginia is found in the USFWS's National Wetlands Inventory (Tiner and Finn, 1986). The Inventory reports that there were approximately 41 290 hectares (102,000 acres) of palustrine wetlands in West Virginia (Table III-15).

Approximately 14% of West Virginia's wetlands are concentrated in two areas: the Canaan Valley complex (9% of state total) and the Meadow River complex (5% of state total). Neither of these areas are in the vicinity of the study area.

TABLE III-15
WEST VIRGINIA WETLANDS

Category	Area		PERCENT OF STATE TOTAL
	Hectares	Acres	
Forested	17 000	42,000	41%
Scrub-Shrub	9700	24,000	23%
Emergent	8090	20,000	20%
Open Water	6500	16,000	16%
TOTAL	41 290	102,000	100%

Source: Tiner and Finn, 1986.

Wetlands identified within the study area are palustrine in nature. In the study area, palustrine wetlands include all non-tidal, freshwater wetlands dominated by trees, shrubs, or persistent vegetation (Cowardin et al., 1979). The following classifications describe the wetlands located within the Build Alternatives:

- **Emergent wetlands (PEM)** are characterized by erect, rooted, herbaceous plants present for most of the growing season. Emergent wetlands are commonly known as marshes, wet meadows, fens, sloughs, or potholes.
- **Scrub-Shrub wetlands (PSS)** are dominated by woody vegetation less than 6 meters (20 feet) tall. The vegetation includes young or small trees as well as true shrubs. Pocosins, shrub swamps, or thickets are included in this vegetation class.
- **Forested wetlands (PFO)** are characterized by woody vegetation over 6 meters (20 feet) in height. These wetlands usually possess an overstory of tree species, an understory of shrubs and small trees, and a herbaceous layer. Forested wetlands are commonly called swamps or bottomlands.

Topography and development restrict the occurrence of wetlands within the study area. Typical wetlands are small (less than 0.4 hectare [1.0 acre]) and are located adjacent to small creeks and streams. Many of the wetlands have developed in old strip mine ponds, railroad rights-of-way, or road rights-of-way. The predominant land uses adjacent to the wetlands are mining or forested. Overall, wetlands within the study area provide limited aquatic and wildlife habitat due to their small size and lack of open water. Many of these wetlands provide moderate to high capacity for pollutant removal, reflecting their past use as strip mine settling ponds.

3.2.3 FLOODPLAINS AND FLOODWAYS

Protection of floodplains and floodways is required by Presidential Executive Order 11988, *Floodplain Management*; USDOT Order 5640.2, *Floodplain Management and Protection*; and 23 CFR Part 650. The intent of these regulations is to avoid or minimize highway encroachments within the floodplain, where practicable, and to avoid supporting land use development that is incompatible with floodplains.

Floodplains are defined as that portion of a river or stream valley, adjacent to the channel, which is covered with water when the river or stream overflows its banks at flood stage. It is also defined as lowland and relatively flat areas adjoining inland and coastal waters including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Floodways are defined as an area of high flooding risk potential, usually immediately adjacent to a river or stream channel and subject to floodwaters of high velocity. Specifically, the floodway refers to that portion of the floodplain which is effective in carrying flow, within which this carrying capacity must be preserved and when the flood hazard is generally highest.

Within the study area, floodplains and floodways are regulated by local Floodway and Floodplain Authorities which include: Logan County, Floodzone Administrator; McDowell County, Director of McDowell County Redevelopment Authority; Mercer County, Flood Control and Fire Coordinator; Mingo County, Flood Coordinator; Wyoming County, Building Permit Director, and Tazewell County.

3.2.3.1 Floodplains

Federal Emergency Management Act (FEMA) designated floodplains within the study area are located along Tug Fork, Buffalo Creek, Sugartree Creek, Stonecoat Branch, Trace Fork, Pigeon Creek, Elk Creek, Rockhouse Creek, Island Creek, Left Fork, Browning Fork, Huff Creek, Little Huff Creek, Muzzle Creek, Indian Creek, Davy Branch, Gilbert Creek, Huff Creek, Guyandotte River, Brown Creek, Elkhorn Creek, North Elkhorn Creek, Simons Creek, Crane Creek, Flipping Creek, Mill Creek, Bluestone River, Lick Creek, Bush Fork, South Fork, Grassy Branch, East River, Brush Fork, Lorton Lick, Perdue Hollow, Beaverpond Creek, Horsepen Creek, Bottom Creek, Johnny Cake Branch and Middle Fork.

3.2.3.2 Floodways

Regulated floodways which fall within the study area occur near the communities of Williamson along the Tug Fork and its tributaries; Delbarton and Varney along Pigeon Creek; Gilbert along Gilbert Creek and Guyandotte River; Iaeger and Davy along Tug Fork; Welch and Hemphill along Tug Fork, Brown Creek, and Elkhorn Creek; and Kimball and Northfork along Elkhorn Creek.

3.2.3.3 Flood Control Projects

The U.S. Army Corps of Engineers implements both non-structural and structural flood control projects in the study area. Non-structural projects include raising buildings above the flood level and purchasing property within the floodplain. Non-structural projects are implemented through voluntary participation of private property owners.

There are two structural flood control projects within the study area: R.D. Bailey Lake and Dam; and the Williamson floodwalls. R.D. Bailey Lake and Dam is a flood control project that was completed in 1980. It is located along the Guyandotte River near the community of Justice in Wyoming County, West Virginia. This flood control project is operated primarily for control of flood damage in the Guyandotte River watershed and as a unit of a comprehensive plan for flood control in the Ohio River Valley.

There are three floodwalls in Williamson, West Virginia. The walls around West Williamson extend for approximately 1830 meters (6,000 feet) along the north shore of the Tug Fork. There is also a wall protecting South Williamson, near the hospital, and a wall protecting the central business district.

In addition to the above flood control projects administered by the U.S. Army Corps of Engineers, the USDA Natural Resource Conservation Service (NRCS) also administers a Public Law-566 watershed protection and flood prevention project in the Brush Creek Watershed, located in Mercer County, West Virginia. The project consists of 4883 hectares (12,060 acres) of conservation land treatment, six single purpose flood retarding dams, three multiple purpose flood retarding-municipal water supply dams, one multiple purpose flood retarding-recreation dam, and approximately 9.45 kilometers (5.86 miles) of channel work. The NRCS is also conducting a study to develop flood control alternatives along the South and Middle Forks, in the upper end of the Brush Creek watershed.

3.2.4 GEOLOGY, MINERAL RESOURCES, SOILS, AND GROUNDWATER

3.2.4.1 Geology

The study area is located within two distinct physiographic provinces. The majority of the study area from Williamson, West Virginia to the Bluestone River near Bramwell, West Virginia lies within the Appalachian Plateau physiographic province. The remainder of the study area from Bramwell to the Virginia/West Virginia state line near Bluefield, West Virginia lies within the Ridge and Valley physiographic province. Geologic erosion has affected the landforms found within the study area. Similarly, the relative resistance to erosion of various rocks has affected the topography of the study area (USDA, 1988).

The geologic units in the western and central portions of the study area (Appalachian Plateau physiographic province) belong to the Alluvium Formation of the Quaternay System and the Allegheny, Kanawha, New River, and Pocahontas Formations of the Pennsylvania System (Alvord and Trent, 1962; Cardwell et al., 1968). The geologic units in the eastern portion of the study area (Ridge and Valley physiographic province) include groups and formations of the Mississippian, Devonian, Silurian, and Ordovician Systems. Limited areas of karst topography are also found within the eastern portion of the study area near Bluefield, West Virginia (Cardwell et al., 1968).

3.2.4.2 Mineral Resources

Coal Mining

The study area lies within the coalfields of the Central Appalachian Basin in southern West Virginia. Coal seams vary in thickness from a few centimeters (inches) to several meters (feet) and can thicken or thin abruptly over a short distance. Individual coal seams can extend over many square kilometers (square miles). According to the West Virginia Geologic and Economic Survey (WVGES), coal resources provided 84.5% of mineral production in West Virginia as of 1992. Mine locations within the study area are shown on Exhibit III-6.

Acid Drainage

Acid producing geologic materials are commonly associated with coal seams. Therefore, acid drainage is typically associated with coal and metal mining operations. However, some geologic deposits are capable of acid production in the absence of coal seams. Acidity is a measurement of the amount of base needed to neutralize a volume of water.

Acid drainage occurs when iron sulfide minerals are exposed and oxidize to form acidic, high sulfate, and high iron leachate (Decker and Jacobsen, 1991). Pyrite is a common iron sulfide found within the study area.

Natural Gas

Natural gas provides 11.5% of the mineral production in West Virginia as of 1992 (WVGES, 1994). Methane has been commercially produced from Central Appalachian Basin coal seams since the early 1930's. The study area lies within a 12 800 square kilometer (5,000 square mile) region that has the highest potential for methane production in the Central Appalachian Basin (Gas Research Institute, 1993). Gas wells in this region target coal seams that are 152 to 909 meters (500 to 3,000 feet) deep.

Water is a by-product of natural gas wells. Water production in the Central Appalachian Basin is typically less than 20 Barrels Per Day (BPD), but is high in total dissolved solids, primarily sodium chloride (Gas Research Institute, 1993).

Saline Water Intrusion

Saline, or salt water, underlies most or all of the study area at varying depths (Bader, 1984a; Shultz, 1984). Salt licks and salt springs are caused by the dynamic relationship between the fresh groundwater and the underlying brine, and the circulation of saline water from great depths to shallow zones. Deep wells tapping into saline waters allow it to flow upward into overlying fresh water zones (Bader, 1984b).

Old oil and gas wells and deep coal-exploration holes with deteriorated casings, or no casings at all, can interfere with groundwater flow patterns and lead to local contamination of fresh water aquifers by salt water (Bader, 1984b). As fresh water flows down through deep improperly cased wells, it causes greater pressure or head to develop in the underlying saline aquifer. The greater head forces salt water to flow up through nearby abandoned and uncased wells until it reaches the fresh water aquifer or the surface.

3.2.4.3 Soils

Soil properties that influence highway construction include stability, shrink-swell potential, and permeability. The majority of the soils found within the study area are mapped as part of the Cumberland Plateau and Mountains Resource Region (USDA, 1979a). The soils found within the study area near Bluefield, West Virginia and Tazewell County, Virginia are mapped as part of the Southern Appalachian Ridge and Valley Resource Region (USDA, 1979b). Nine major soil associations have been identified within the study area. Each association has a distinctive pattern of soils, relief, and drainage, and is a unique natural landscape (USDA, 1988). Table III-16 identifies the major soil associations mapped within the study area and their descriptive properties.

3.2.4.4 Groundwater

Groundwater is derived from precipitation that filters through various soil and rock formations and is collected in the zone of saturation. The zone of saturation is the area found below the water table where water occupies all open space.

Portions of the Tug Fork, Guyandotte River, and Upper New River watersheds are found within the study area (Exhibit III-5). Within each watershed, groundwater and surface waters are interrelated.

Typically, groundwater flow mirrors the topography of the watershed. The water table is highest under hills and lowest in valleys. However, due to the thicker unsaturated zones found under hills, deeper wells are generally required. Permeability is usually greater in valley bottoms and groundwater flows from the hills into nearby valleys. Wells in the valleys usually pierce thinner unsaturated zones, yield more water, and have shallower water levels (Bader, 1984b). Groundwater quality is variable throughout the study area. Factors influencing groundwater quality include: the amount of water that flows through the groundwater system; the chemistry of the rock stratum through which it flows; and the potential for human produced pollutants that may enter the groundwater system. There are no sole source aquifers located within the study area in Virginia or West Virginia (VADEQ, 1996; WVDHHR, 1996). Table III-17 identifies the geologic units found in each watershed within the study area, associated water-bearing potentials, and associated water quality characteristics.

TABLE III-16
PREDOMINANT STUDY AREA SOIL ASSOCIATIONS

Soil Association	Characteristics
Clymer-Gilpin-Udorthents	Deep to moderately deep, well drained, acid soils on strongly sloping to very steep uplands.
Berks-Pineville	Moderately deep and very deep, well drained soils on very steep uplands, foot slopes and mountain coves.
Calvin high base substratum-Berks-Gilpin	Moderately deep, well drained, acid and lime-influenced soils which occur on strongly sloping to very steep uplands.
Cedarcreek-Dekalb-Kaymine	Very deep and moderately deep, well drained soils on very steep uplands.
Clymer-Dekalb-Jefferson	Deep, well drained soils on mountain tops and broad benches, and moderately deep, well drained soils on ridge tops, hillsides, and mountainsides, and well drained soils on moderately steep to steep foot slopes, heads of drainageways, and mountain coves.
Dekalb-Berks-Weikert	Moderately deep, well drained soils on ridge tops, hillsides, and mountainsides, and very steep and well drained soils on narrow ridges, benches, and hillsides that are dissected by many drainageways.
Calvin-Berks	Moderately deep, well drained, lime-influenced and acid soils which occur on strongly sloping to very steep ridge tops, benches, and side slopes that are dissected by drainageways.
Fredrick-Elliber	Well drained soils which occur on gently sloping to very steep ridge tops and well drained soils on nearly level to steep side slopes and ridge tops.
Murrill-Fredrick-Caneyville	Deep to moderately deep, well drained, acid and lime-influenced soils which occur as very stony, very rocky, or nonstony soils on strongly sloping to very steep uplands and at the heads of drainageways.

Sources: USDA, 1988, and 1984.

TABLE III-17
GROUNDWATER WITHIN THE STUDY AREA

Watershed	Geologic Units, Water-bearing Potential, and Water Quality
Tug Fork	Allegheny, Kanawha, New River, and Pocahontas Formations: These formations have low to moderate potential for industrial and public water supplies, are useful for domestic and small commercial supplies, yields range from 0.02 to 25.2 Lps (0.25 to 400 gpm). They are generally suitable for domestic use, but manganese and iron concentrations, and hardness occur, pH ranges between 6.5 and 7.5.
Guyandotte River	Allegheny, Kanawha, New River, and Pocahontas Formations: These formations have low to moderate potential for industrial and public water supplies, is useful for domestic and small commercial supplies, yields range from 0.03 to 21.4 Lps (0.5 to 340 gpm). They are generally suitable for domestic use, but occasionally high concentrations of iron, chloride, or hardness may occur, pH ranges between 6.5 and 7.5.
Upper New River	New River and Pocahontas Formations of the Pottsville Group from the Pennsylvanian System: Water from these formations is of the calcium bicarbonate type and is mostly alkaline. It may exhibit high concentrations of iron and manganese. The Bluestone, Princeton, Hinton, and Bluefield Formations of the Mauch Chunk Group, Greenbrier Group, and the MacCrady Formation and Pocono Group from the Mississippian System: Water from the Mauch Chunk Group is highly mineralized and variable in chemical character. Water in the limestone of the Greenbrier Group is subject to contamination through sinkholes and can contain high concentrations of iron and manganese. The Pocono Group yields the most mineralized water in the watershed and also has the highest concentrations of sodium and chloride. Hampshire, Brallier, Mahantango, Marcellus, McKenzie, Juniata and Oswego, Martinsburg Formations, Harrell Shale, Tuscarora Sandstone, Chemung Group, St. Paul Group, and Lower Ordovician Group of the Devonian System and older rocks: Water from the Devonian System and older rocks may have high iron concentrations and range from hard to very hard. However, it is generally considered the best in the basin. Well yields within the watershed range from 0.03 to 31.6 Lps (0.5 to 500 gpm).

Sources: Alvord and Trent, 1962; Bader, 1984a, 1984b; and Schultz, 1984.
Note: Lps = liters per second
gpm = gallons per minute

3.2.4.5 Groundwater Users

The rural population of the study area utilizes either individual groundwater wells or other sources including springs, cisterns, and bottled water for drinking water supplies.

Population centers in the study area that are served by public water systems using groundwater sources are presented in Table III-18. The State of West Virginia is currently developing new Well Head Protection Areas (WHPA's) for public wells. During the interim, the WVDHHR recommends that a radius of 606 meters (2,000 feet) be used as a buffer zone around such wells. The Virginia Department of Health, Office of Water Programs requires that all roadway projects maintain a minimum 15.2 meter (50 foot) buffer zone around groundwater wells.

TABLE III-18
PUBLIC WATER SYSTEMS USING GROUNDWATER SOURCES

County	Number of Wells	Users
Mingo, WV	1	Delbarton Elementary School
	2	Town of Delbarton
	1	Creekwood Apartments Newtown
	2	Colonial Stairs and Woodworking
	1	Varney Elementary School
	2	Sharon Heights Water
	1	Gilbert High School
	1	Gilbert Terrace Apartments
	1	Justice Public Service District
Wyoming, WV	1	Huff Consolidated Elementary
McDowell, WV	2	Elkhorn Public Service Company - Upland/Powell/Kyle
	1	Kimball Light and Water - Landgraff
	2	Kimball Light and Water - Tidewater
	1	McDowell County Public Service District - Premier
	1	Northfork Water Work
	1	Kimball Light and Water - Kimball/Carswell
Mercer, WV	2	Coppola's Mobile Home Park

Source: WVDHHR, 1995.

3.2.5 VEGETATION AND WILDLIFE

The study area is located within the Allegheny Plateau Section of the Appalachian Plateau physiographic province of West Virginia and Virginia (Fenneman, 1938). Numerous "hollows" exist where smaller streams have cut through the rocks. A dendritic drainage system has developed over the flat-lying sedimentary rocks within the study area. Elevations generally range from 243 to 912 meters (800 to 3,000 feet) across the study area. The average relief from ridge top to valley bottom is approximately 275 meters (900 feet).

3.2.5.1 Vegetation

A total of 4.9 million hectares (12.1 million acres) of West Virginia is Forested Land, representing 80% of the state's land area. Oak/hickory is the dominant forest-type group comprising 77% of the state's timberland (USDA, 1990).

Tazewell County, Virginia is immediately south of and adjacent to McDowell County, West Virginia. In terms of geography, vegetation, meteorological influences, and land use, Tazewell County is similar to the West Virginia portion of the study area. During the half century between 1870 and 1920, the forests of West Virginia and the northern portion of Virginia were subjected to such intensive logging that by the end of this period the original forests had been essentially eliminated (Clarkson, 1968). Extensive forest fires, fueled by large amounts of logging slash, also destroyed large areas of virgin timber. As a result of the extensive logging and frequent fires that occurred throughout the forest region during this period, the present day forest vegetation is mostly a mosaic of second and third-growth forest communities (Stephenson, 1993).

Land use and land cover types within the study area are presented in Table III-19. Deciduous forest is the dominant vegetation type within the study area, covering over 88% of the entire study area. The present forest vegetative community lies in the Central Hardwood Forest Region and is broadly classed in the oak-hickory forest type. The average age of the forest is between 65 and 80 years old (Stephenson, 1993).

TABLE III-19
LAND USE AND LAND COVER TYPES WITHIN THE STUDY AREA

Land Use and Land Cover Types *	Hectares	Acres	Percent of Total
11 - Residential	5897.7	14,572.9	4.3
12 - Commercial	527.9	1,304.5	0.4
13 - Industrial	478.7	1,182.9	0.4
14 - Transportation, Utilities	553.8	1,368.5	0.4
16 - Mixed Urban or Built-Up Land	423.2	1,045.8	0.3
17 - Other Urban or Built-Up Land	67.4	166.4	0.05
21 - Cropland and Pasture	2797.2	6,911.8	2.0
41 - Deciduous Forest	120 455.2	297,640.7	88.6
43 - Mixed Forest	104.9	259.1	0.07
53 - Reservoirs	121.7	300.6	0.08
75 - Strip Mines	2854.8	7,054.0	2.1
76 - Transitional Areas	1746.4	4,315.3	1.3
Total	136 028.9	336,122.5	100

Note:* Based on Anderson et al., 1976.

Two distinct vegetative communities, oak forests and cove hardwoods, were identified during field investigations based on aspect, moisture, and elevation regimes. Oak forests constitute the most extensive cover type in the study area and are associated with ridge tops and dryer south and southwest slopes. Cove hardwoods are found in cool, moist valley bottoms and on lower slopes and are generally associated with north facing slopes.

Surface mining has removed over 5000 hectares (12,000 acres) of forest cover within the study area, and the majority of reclamation practices have resulted in the regrowth of grassland and shrubland, rather than forest, on surface mine sites. Recently, several mining companies, in conjunction with the WVDNR Wildlife Resources Section, have developed wildlife management plans for reclaimed surface mine areas.

3.2.5.2 Wildlife

Wildlife is an important ecological, economic, and recreational resource of West Virginia and Virginia. A wide range of terrestrial wildlife resources are present within the forested landscape which dominates (greater than 88%) the study area. These resources include a variety of game, non-game, and furbearing mammals, game birds, non-game birds, raptors, reptiles, and amphibians. Since most studies have been conducted on game and endangered or threatened species within the states, little quantitative information exists on distribution and abundance of the majority of West Virginia and Virginia wildlife.

Over 50 mammalian species have been reported as occurring in the State of West Virginia (WV Division of Forestry, 1990). The majority of these of mammalian species utilize a variety of land cover types. Deciduous forests, reclaimed surface mines, agricultural fields, and waterways are all important habitats for mammals in the study area.

Hall (1983) reported that 234 avian species regularly occur in West Virginia and 122 of these species breed within the Allegheny Plateau physiographic province. In addition to forested communities, many reclaimed surface mines, typically beginning as grass-legume meadows, provide avian wildlife habitat. A variety of bird species are adapted to this early successional vegetation and the surrounding edge habitat that is created where forest and herbaceous habitat meet.

Amphibians and reptiles are important members of the forest community and play a role in nutrient recycling, predator-prey relationships, and energy flow. Over 80 species of amphibians and reptiles are found within the Allegheny Plateau physiographic province (Green and Pauley, 1987). The majority of these species are associated with deciduous forest communities. Reclaimed surface mine sediment ponds also provide valuable breeding areas for many frog, salamander, and turtle species.

3.2.6 RARE, THREATENED, AND ENDANGERED SPECIES

The Endangered Species Act of 1973 (16 USC 1531 et seq.) declared the intention of Congress to conserve threatened and endangered species and the ecosystems on which those species depend. The Act provides that federal agencies utilize their authority by carrying out programs for the conservation of endangered or threatened species. The USFWS is the primary environmental regulatory agency responsible for enforcing the Endangered Species Act. West Virginia does not have state legislation to protect threatened or endangered species but relies solely upon the federal legislation to protect this resource. The Commonwealth of Virginia provides legislation that protects plant and animal species deemed threatened or endangered within the state. Although West Virginia does not have state legislation affording protection to state listed species as with federally listed threatened and endangered species, a review of impacts to the state listed species should be considered in the overall planning process of any project.

Table III-20 presents the federally-listed, federal species of concern, and state-listed species potentially occurring within the study area.

TABLE III-20
RARE, THREATENED, AND ENDANGERED SPECIES POTENTIALLY OCCURRING IN STUDY AREA

Species	Common Name	Federal Status	WV Rank	VA Rank	Location
Myotis sodalis	Indiana bat	E	--	S1	Mercer County, WV Tazewell County, VA
Plecotus townsendi virginianus	Virginia big-eared bat	E	--	S1	Tazewell County, VA
Spiraea virginiana	Virginia spiraea	T	S1	--	Mercer County, WV

Sources: VDGIF, 1995; USFWS, 1995; and WVDNR, 1995a.
Note: T = Federally Threatened; E = Federally Endangered; S1 = Critically Imperiled Within the State.

3.3 PHYSICAL ENVIRONMENT

3.3.1 VISUAL QUALITY

The visual experience in the study area is generally characterized by mountainous areas with narrow valleys, which have been formed by small rivers and creeks. The land use/land cover is almost wholly Forested Land with small portions of Urban/Built Land and strip mines sparsely distributed throughout the study area. In general, the area is rural and relatively sparsely populated. The only exception is in the wider areas of the valleys, where some development has occurred because of the greater availability of flat land. In the eastern sections of the study area, particularly Mercer County, the terrain is not as mountainous and is characterized more by wider valleys and increased development in the vicinity of Bluefield and Princeton.

3.3.2 HAZARDOUS MATERIALS

Several federal laws regulate the handling of hazardous materials and wastes. These laws include the Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response, Compensation, Liability Act (CERCLA or Superfund), including the Superfund Amendments and Reauthorization Act (SARA), Toxic Substances Control Act (TSCA), and Hazardous and Solid Waste Amendments of 1984 (HSWA). These federal laws give the USEPA responsibility for regulating hazardous waste. In response to this directive, USEPA is inventorying uncontrolled sites and has published the National Priority List (NPL). The objective of placing sites on the NPL is their ultimate cleanup.

Hazardous materials sites within the study area were identified using information obtained from Environmental Risk Information and Imaging Service (ERIIS), the U.S. Environmental Protection Agency (USEPA), the West Virginia Division of Environmental Protection (WVDEP), and the Virginia Department of Environmental Quality (VADEQ). Sites identified in the study area include:

- RCRA regulated facilities.
- Emergency Response Notification System (ERNS) identified sites.
- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) sites.

The RCRA regulated facilities include generators of hazardous waste, transporters of waste, and Treatment, Storage, and Disposal (TSD) facilities.

Gas stations and automotive repair services are examples of such facilities. RCRA Class I generators are those that produce 1000 kilograms (2,200 pounds) or more of hazardous waste per month. Underground storage tanks (USTs) are also regulated under RCRA, through standards for tank performance and management.

The ERNS is a computerized database which contains information on the release of hazardous materials into the environment. Within the study area, there are two surface water bodies, Pigeon Creek and the Bluestone River, which were each affected by an ERNS identified site. The incident affecting Pigeon Creek occurred in the vicinity of Delbarton. The incident affecting the Bluestone River occurred in the vicinity of Bluefield.

There is one CERCLIS site in the study area, the Iaeger PCB site. CERCLIS sites are areas where past activities using hazardous substances have contaminated or continue to contaminate the soils, water, or air. CERCLIS sites include those on the NPL, those which are still in the assessment process, and those sites which have been assessed and not determined appropriate for the NPL. The Iaeger PCB site is not on the NPL.

3.3.3 NOISE AND AIR QUALITY

3.3.3.1 Noise

Land use determines the sensitivity of an area to noise. Residential areas are the most sensitive to noise, particularly single family homes. Land uses which are less sensitive to noise include open land, forested areas, commercial properties and agricultural areas. Land use within the study area can be characterized as predominantly forest land.

Table III-21 shows the FHWA Noise Abatement Category (NAC) Criteria for various land use Activity Categories. Activity Category B, representative of residences, schools, churches, and parks, was used as the criteria for sensitive receptors identified in the study area.

TABLE III-21
NOISE ABATEMENT CATEGORY CRITERIA
HOURLY A-WEIGHTED SOUND LEVEL- DECIBELS

Activity Category	Leq (h)	Description of Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: Federal Aid Highway Program Manual Transmittal 348, Vol. 7, Ch. 7, Sec. 3, Attachment, 1982.

Fifteen short-term sound level measurements were taken at different sites (Exhibit III-7). Table III-22 shows existing noise levels (Leq), land uses, the measurement period, and the dominant noise source at the 15 noise monitoring sites. Table III-23 identifies the site name and general location, the hourly vehicle volumes, the distances from existing roadways and the estimated travel speeds on the roads adjacent to the monitoring sites as applicable.

TABLE III-22
MEASURED NOISE LEVELS WITHIN STUDY AREA

Monitoring Location No.	Land Use	Measurement Period	Period Date	Leq (dBA)	Dominant Noise Source
1	Residence	5:28 – 5:40 p.m.	9/25/95	69	Mingo County 52/9
2	Park	4:31 – 4:43 p.m.	9/25/95	61	US 52
3	Church	2:10 – 2:22 p.m.	9/25/95	63	WV 65, US 119
4	School	3:58 – 4:10 p.m.	9/25/95	61	US 52
5	Medical Facility	3:25 – 3:37 p.m.	9/25/95	67	US 52
6	Church	7:16 – 7:28 a.m.	9/26/95	65	US 52
7	Church	3:00 – 3:12 p.m.	9/27/95	62	McDowell County 14
8	Church	4:18 – 4:30 p.m.	9/27/95	64	US 52, Mercer County 120
9	State Park	5:10 – 5:22 p.m.	9/27/95	60	US 52
10	Church	4:46 – 4:58 p.m.	9/28/95	54	Mercer County 120, 20/9
11	Residence	5:34 – 5:46 p.m.	9/28/95	64	Mercer County 71, US 52
12	Church	6:18 – 6:30 p.m.	9/28/95	58	US 52
13	Church	6:01 – 6:13 a.m.	9/29/95	53	Mercer County 71/13
14	Residence	9:35 – 9:47 a.m.	9/29/95	59	Mercer County 25/3, 25, US 19/460
15	Church	8:45 – 8:57 a.m.	9/29/95	64	Mercer County 11

TABLE III-23
MEASUREMENT SITE CHARACTERISTICS

Measurement Site	Site Name And General Location	Hourly Vehicle Volumes						Distance From Near Travel Lane C/L	Estimated Speed
		Near Lane			Far Lane				
		A	MT	HT	A	MT	HT		
1	Residence Goodman, WV	10	0	0	20	0	0	3.4 meters (11 feet)	33 kph (20 mph)
2	Rev. W.H. Compton Park	200	5	0	160	5	0	15 meters (50 feet)	56 kph (35 mph)
3	Belo United Baptist Church	70	0	0	110	0	10	14 meters (46 feet)	40 kph (25 mph)
4	Mingo County Vo-Tech	190	10	25	195	10	5	26 meters (85 feet)	64 kph (40 mph)
5	Varney Medical Center	125	10	20	140	0	5	11 meters (36 feet)	64 kph (40 mph)
6	Freedom Full Gospel Assembly	95	10	30	80	5	30	26 meters (85 feet)	64 kph (40 mph)
7	Crumpler Methodist Church	5	5	10	35	5	5	4.9 meters (16 feet)	33 kph (20 mph)
8	Church of God Bramwell, WV	95	0	20	25	0	0	3.4 meters (11 feet)	48 kph (30 mph)
9	Pinnacle Rock State Park	230	15	10	270	5	15	24 meters (80 feet)	72 kph (45 mph)
10	Mill Creek Baptist Church	35	5	0	45	0	0	610 meters (2,000 feet)	64 kph (40 mph)
11	Residence Bluewell, WV	260	10	0	335	5	0	7.9 meters (26 feet)	64 kph (40 mph)
12	Brushfork Methodist Church	550	20	10	700	0	0	914 meters (3,000 feet)	72 kph (45 mph)
13	Sandlick Methodist Church	20	0	0	60	0	0	7.9 meters (26 feet)	56 kph (35 mph)
14	Residence Stony Gap, WV	120	5	0	90	0	0	7.9 meters (26 feet)	56 kph (35 mph)
15	Midway Church of Christ	90	0	0	110	0	0	4.9 meters (16 feet)	64 kph (40 mph)

Note: A = Automobile (including vans, pickup trucks and motorcycles)
MT = Medium Truck (two-axle/six-tires) kph = kilometers per hour C/L = Centerline
HT = Heavy Truck (three or more axles) mph = miles per hour

Within the study area, the existing year conditions and the design year No Build Alternative modeling was based on US 52 (study route) from Williamson, West Virginia to Bluefield, West Virginia. This roadway represents the primary highway system currently utilized between the project termini. There are a total of 6,678 sensitive receptors located within a 300 meter (984 foot) corridor surrounding US 52 (study route). The sensitive receptors consist of 6,476 residences, 104 churches, 41 cemeteries, 36 public schools, 3 medical facilities, 13 recreation parks, and 5 community facilities.

3.3.3.2 Air

The study area (Mingo, Logan, McDowell, Wyoming, and Mercer counties in West Virginia; and Tazewell County, Virginia) is located within Region 3 of the U.S. Environmental Protection Agency's (USEPA) jurisdiction. The agencies involved with air quality in this region are the USEPA, WVDOT, WVDEP, VDOT, and Virginia Department of Environmental Quality.

The Clean Air Act of 1977 directed the USEPA to establish standards for clean air. The USEPA promulgated the National Ambient Air Quality Standards (NAAQS) for the six atmospheric pollutants most important to air quality: Carbon Monoxide (CO), Ozone (O_3), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), Particulate Matter (PM_{10}), and lead (Pb). Table III-24 identifies the NAAQS and the levels of these six atmospheric pollutants and exposure periods that pose no significant threat to human health or welfare. West Virginia and Virginia adhere to the same air quality standards.

Currently, air monitoring is conducted for these pollutants at various locations throughout the states by the National Air Monitoring System (NAMS) and State and Local Air Monitoring System (SLAMS) programs. The nearest monitor for the study area representing a rural environment is located in Greenbrier County, West Virginia (Site I.D. 54-025-0001).

As a result of the Clean Air Act Amendments and based on historical monitoring data, all of the counties in the study area are designated as being in attainment for CO and O_3. The term "attainment" refers to the status of the various pollutants described in the NAAQS (Table III-24). If a pollutant does not exceed the standard by an average of more than 1.0 times over a three-year period, then it is considered in attainment of the standard for its area. If a pollutant exceeds the standard more than the average of 1.0 times, it is considered in non-attainment of the standard.

TABLE III-24
NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Time of Average Exposure Periods	Primary Standard Levels[a]	Secondary Standard Levels
PM_{10}	Annual Arithmetic Mean 24-Hour[e]	50 ug/m^3 150 ug/m^3	Same as Primary
$PM_{2.5}$	Annual Arithmetic Mean[f] 24-Hour[g]	15 ug/m^3 65 ug/m^3	Same as Primary
SO_2	Annual Arithmetic Mean 24-Hour[b]	80 ug/m^3 365 ug/m^3	3-hour[b] 1300 ug/m^3
NO_2	Annual Arithmetic Mean	0.053 ppm (100 ug/m^3)	Same as Primary
CO	8-Hour[b]	9 ppm (10 mg/m^3)	None
	1-Hour[b]	35 ppm (40 mg/m^3)	None
O_3	1-Hour[c]	0.12 ppm (235 ug/m^3)	Same as Primary
	8-Hour[d]	0.08 ppm (157 ug/m^3)	Same as Primary
Pb	Maximum Quarterly Average	1.5 ug/m^3	Same as Primary

a-Parenthetical value is an approximate equivalent concentration
b-Not to be exceeded more than once per year
c-Not to be exceeded more than once per year on average
d-3 year average of annual 4th highest concentration
e-The preexisting form is exceedance based. The revised form is the 99th percentile
f-Spatially averaged over designated monitors
g-The form is the 98th percentile
ug/m^3-micrograms per cubic meter of air
ppm-parts per million
mg/m^3-milligrams per cubic meter of air
Source: USEPA, 1997.

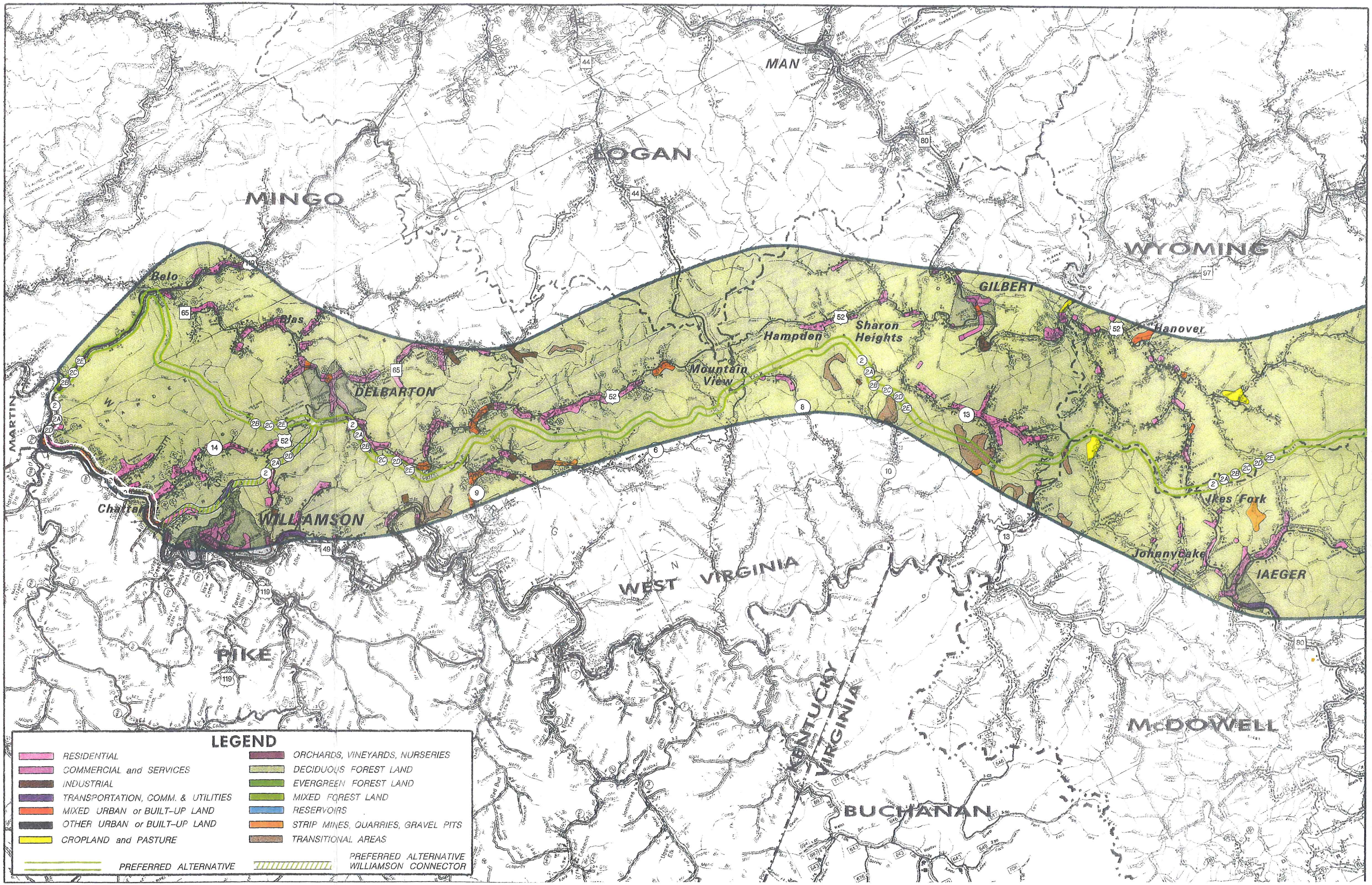
When a project is located in an area that is designated as non-attainment, it must be on an approved Transportation Improvement Plan or meet a series of requirements in order for the project to be approved.

Within the study area, the existing year conditions were based on US 52 (study route) from Williamson, West Virginia to Bluefield, West Virginia. This roadway represents the primary highway system currently utilized between the project termini.

The highest concentrations are predicted to occur at the signalized intersection of US 52 and WV 16, US 52 Bypass, and WV 103 in the town of Welch, West Virginia. These concentrations are the highest because the predicted traffic volumes are the highest and the average speeds are slower.

The highest predicted one-hour CO concentration for the year 1995 existing condition is 2.5 parts per million. Based on these results, there are no exceedances of either the one- or eight-hour criteria at any receptor for the existing condition.

AFFECTED ENVIRONMENT EXHIBITS



MAN
LOGAN
MINGO
WYOMING
GILBERT
Hanover
Belo
Hampden
Sharon Heights
Mountain View
DELBARTON
WILLIAMSON
Chattaroy
Ikes Fork
Johnnycake
IAEGER
MARTIN
PIKE
WEST VIRGINIA
KENTUCKY
VIRGINIA
BUCHANAN
McDOWELL
LEGEND
RESIDENTIAL
COMMERCIAL and SERVICES
INDUSTRIAL
TRANSPORTATION, COMM. & UTILITIES
MIXED URBAN or BUILT-UP LAND
OTHER URBAN or BUILT-UP LAND
CROPLAND and PASTURE
ORCHARDS, VINEYARDS, NURSERIES
DECIDUOUS FOREST LAND
EVERGREEN FOREST LAND
MIXED FOREST LAND
RESERVOIRS
STRIP MINES, QUARRIES, GRAVEL PITS
TRANSITIONAL AREAS
PREFERRED ALTERNATIVE
PREFERRED ALTERNATIVE WILLIAMSON CONNECTOR

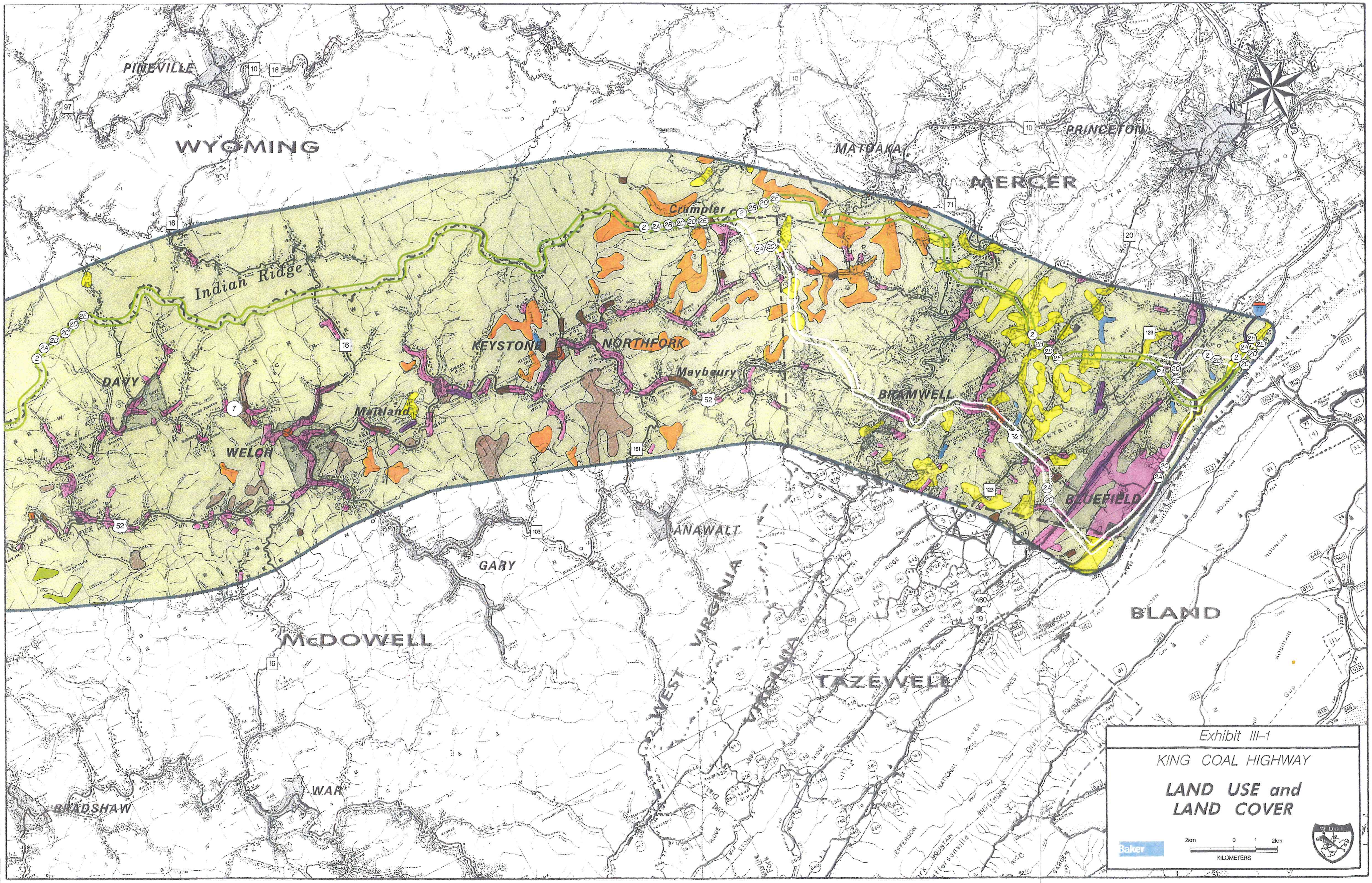


Exhibit III-1

KING COAL HIGHWAY

LAND USE and LAND COVER

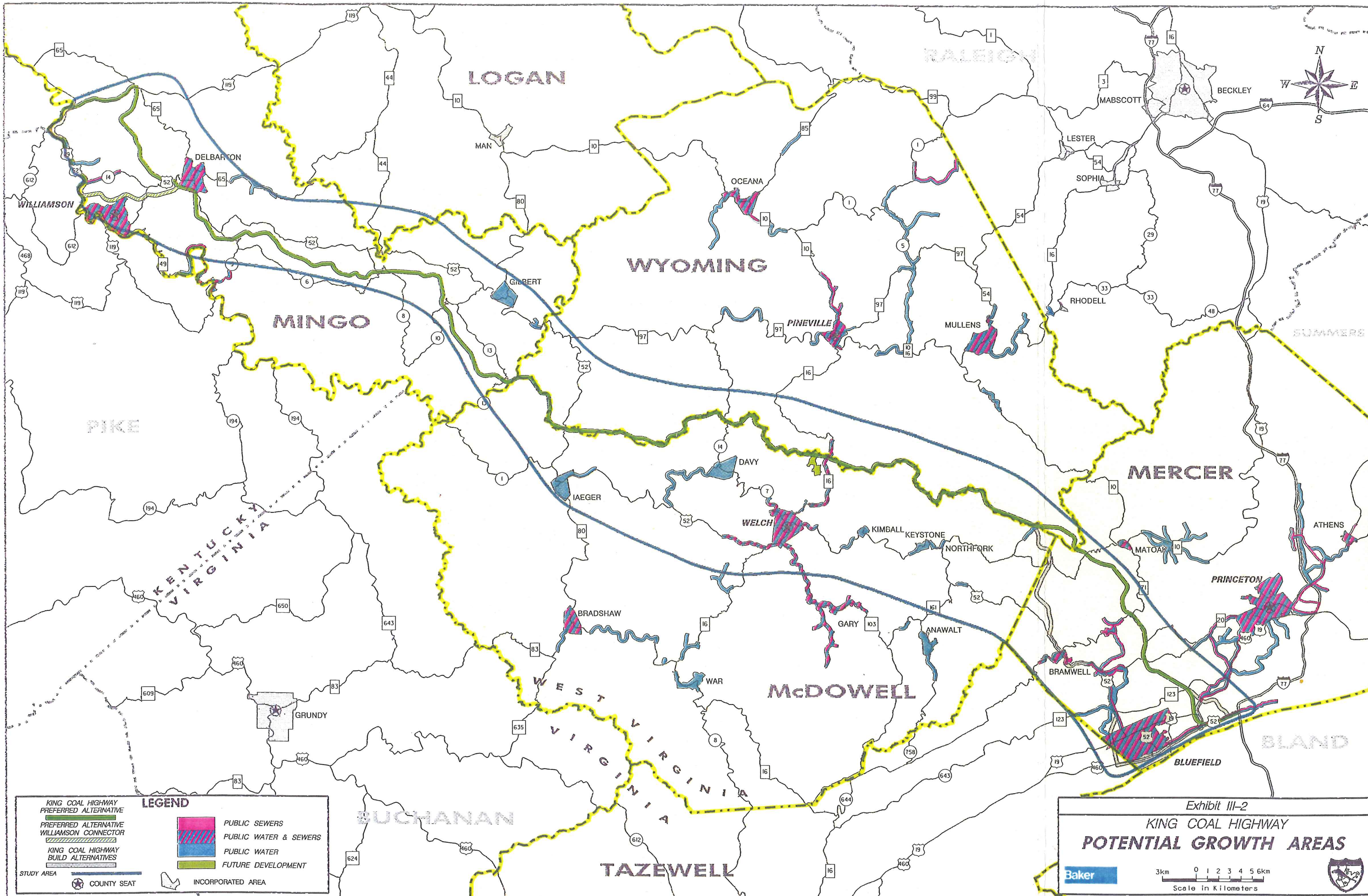


Exhibit III-2
KING COAL HIGHWAY
POTENTIAL GROWTH AREAS
Baker
3km 0 1 2 3 4 5 6km
Scale in Kilometers
LEGEND
KING COAL HIGHWAY PREFERRED ALTERNATIVE
PREFERRED ALTERNATIVE WILLIAMSON CONNECTOR
KING COAL HIGHWAY BUILD ALTERNATIVES
STUDY AREA
COUNTY SEAT
PUBLIC SEWERS
PUBLIC WATER & SEWERS
PUBLIC WATER
FUTURE DEVELOPMENT
INCORPORATED AREA
LOGAN
RALEIGH
WYOMING
MINGO
PIKE
MERCER
McDOWELL
SUMMERS
BLAND
BUCHANAN
TAZEWELL
KENTUCKY
VIRGINIA
WEST VIRGINIA
WILLIAMSON
DELBARTON
MAN
GILBERT
OCEANA
PINEVILLE
MULLENS
BECKLEY
MABSCOTT
LESTER
SOPHIA
RHODELL
DAVY
IAEGER
WELCH
KIMBALL
KEYSTONE
NORTHFORK
MATOAKA
ATHENS
PRINCETON
BRADSHAW
GARY
ANAWALT
WAR
BRAMWELL
BLUEFIELD
GRUNDY

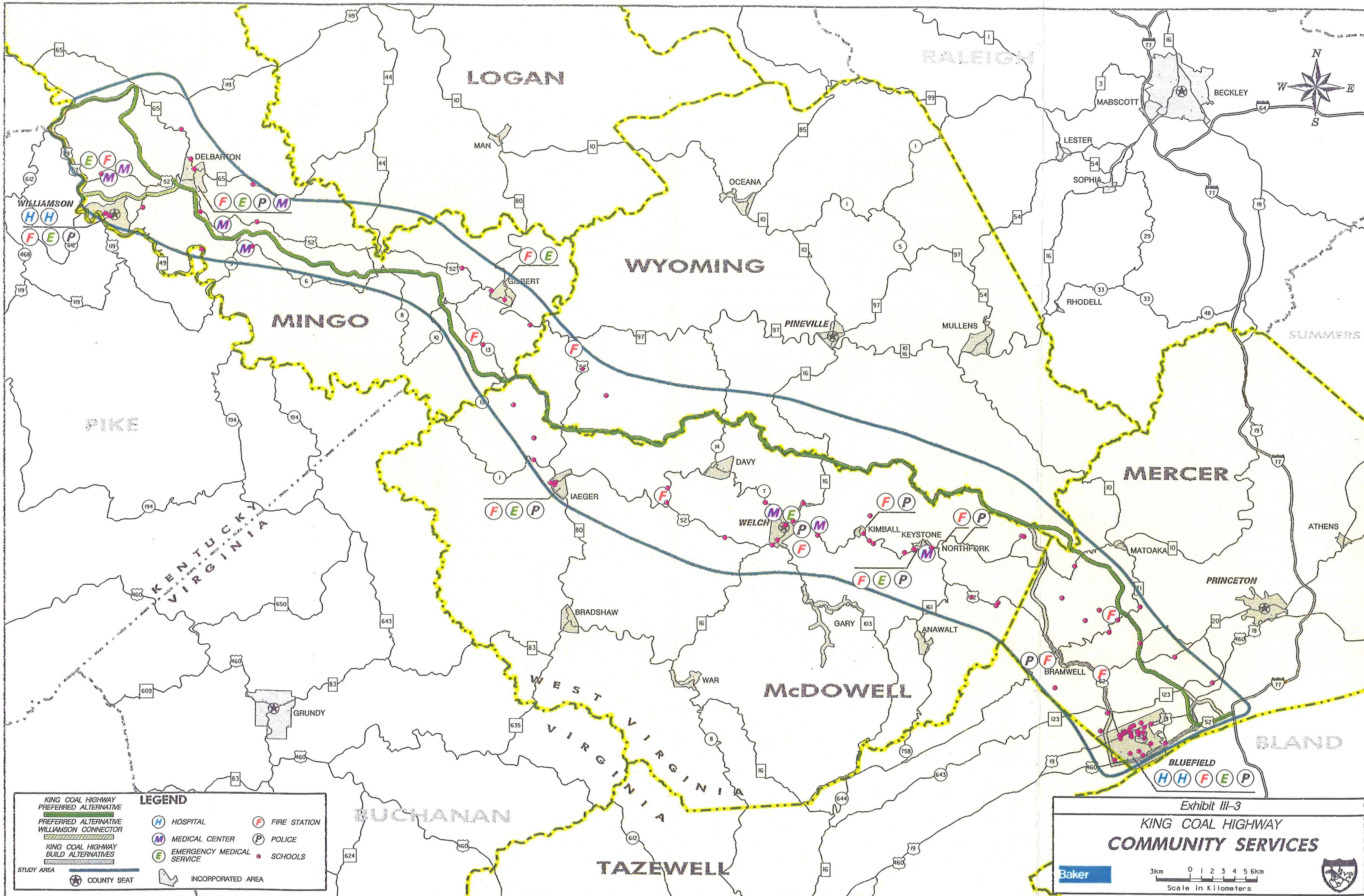


Exhibit III-3
KING COAL HIGHWAY
COMMUNITY SERVICES

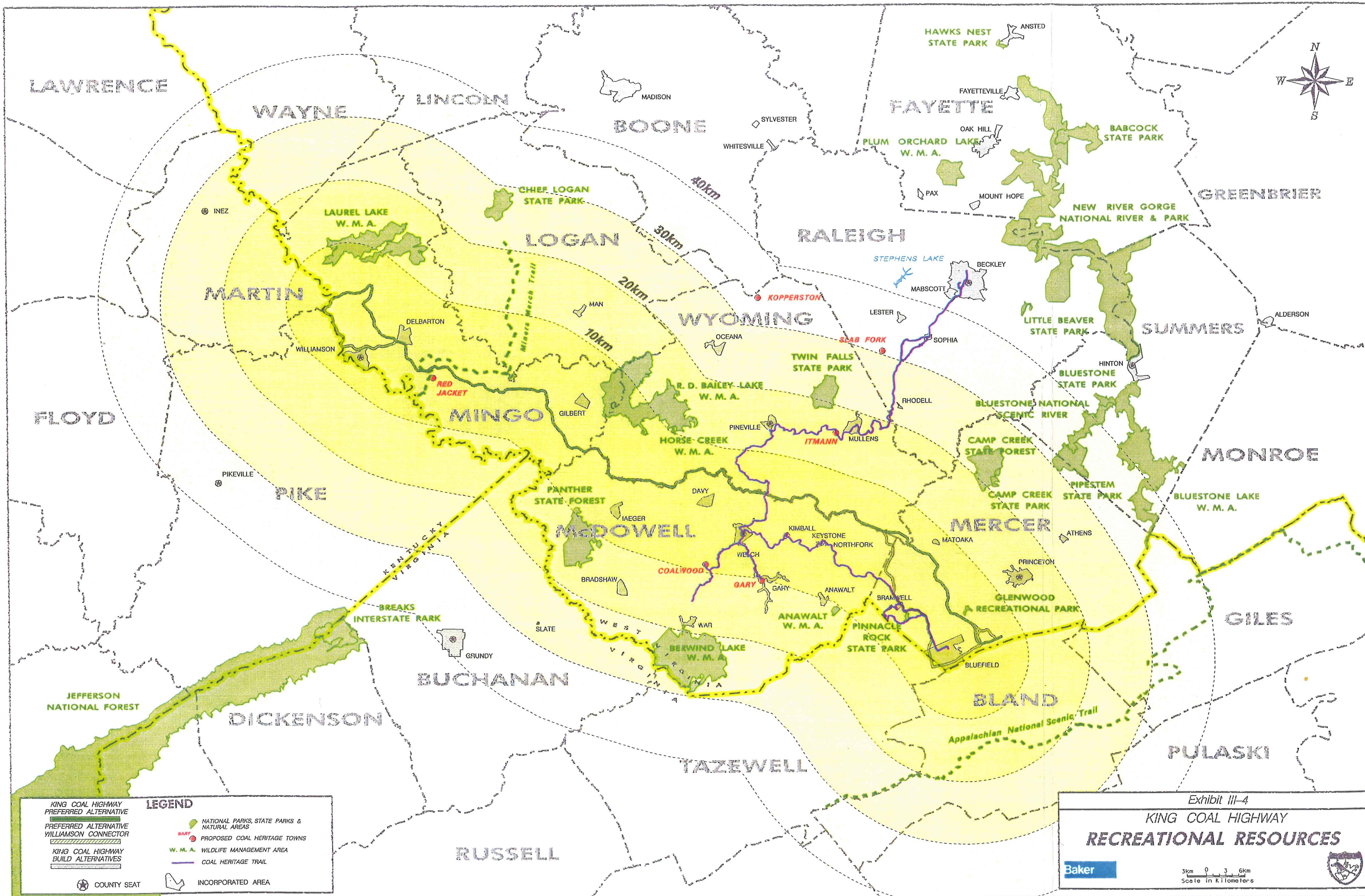


Exhibit III-4

KING COAL HIGHWAY

RECREATIONAL RESOURCES

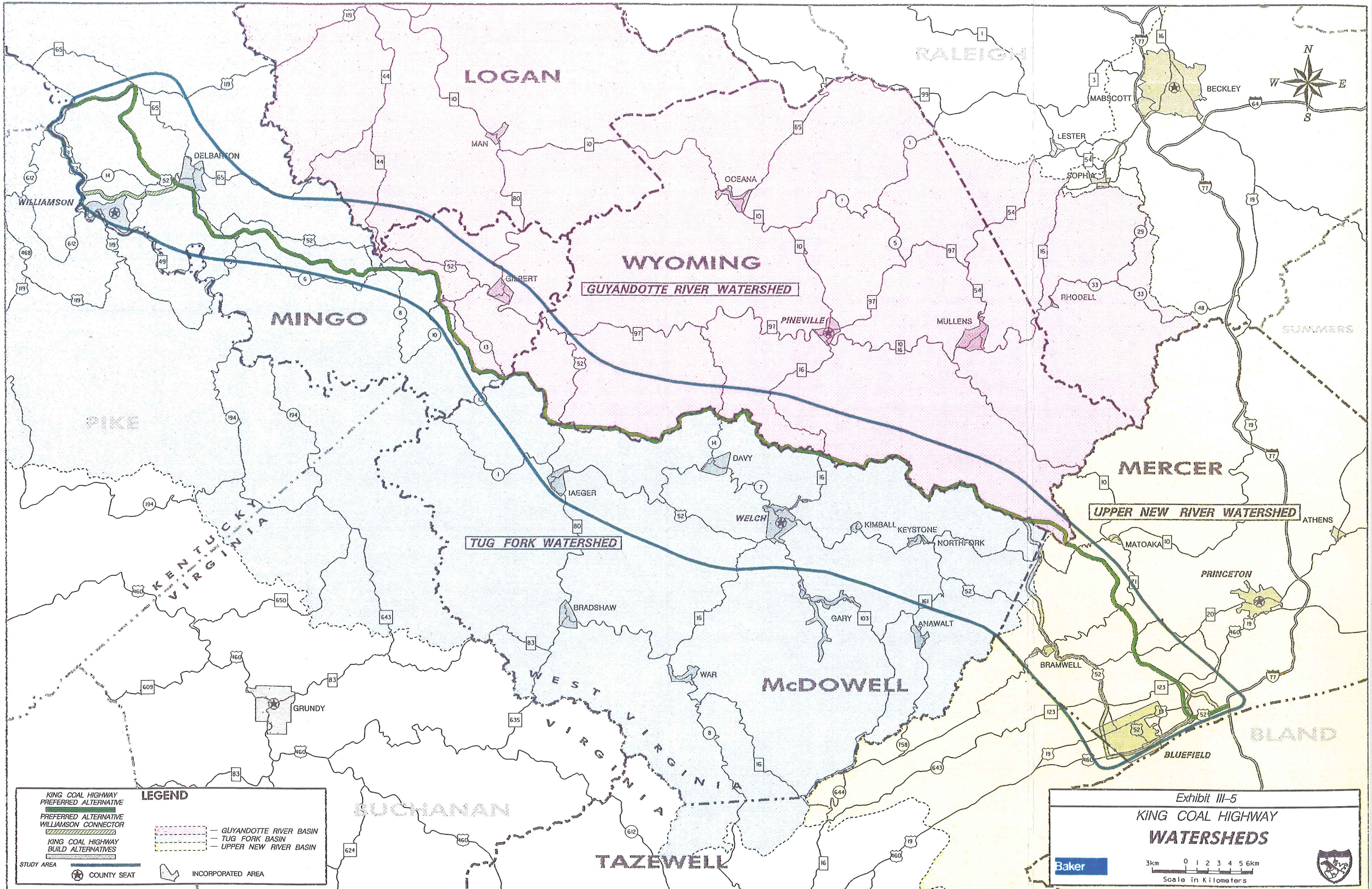


Exhibit III-5
KING COAL HIGHWAY
WATERSHEDS

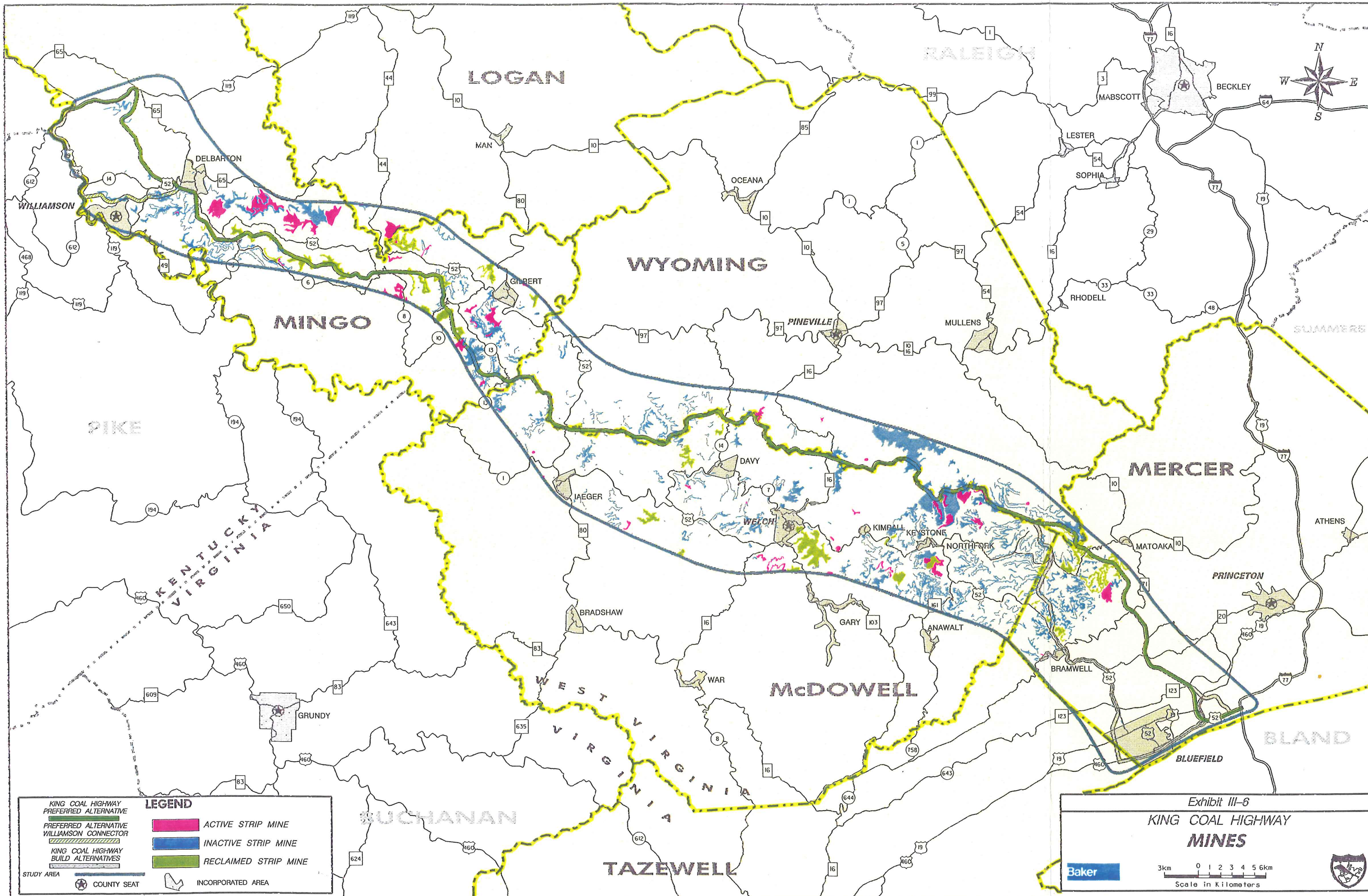
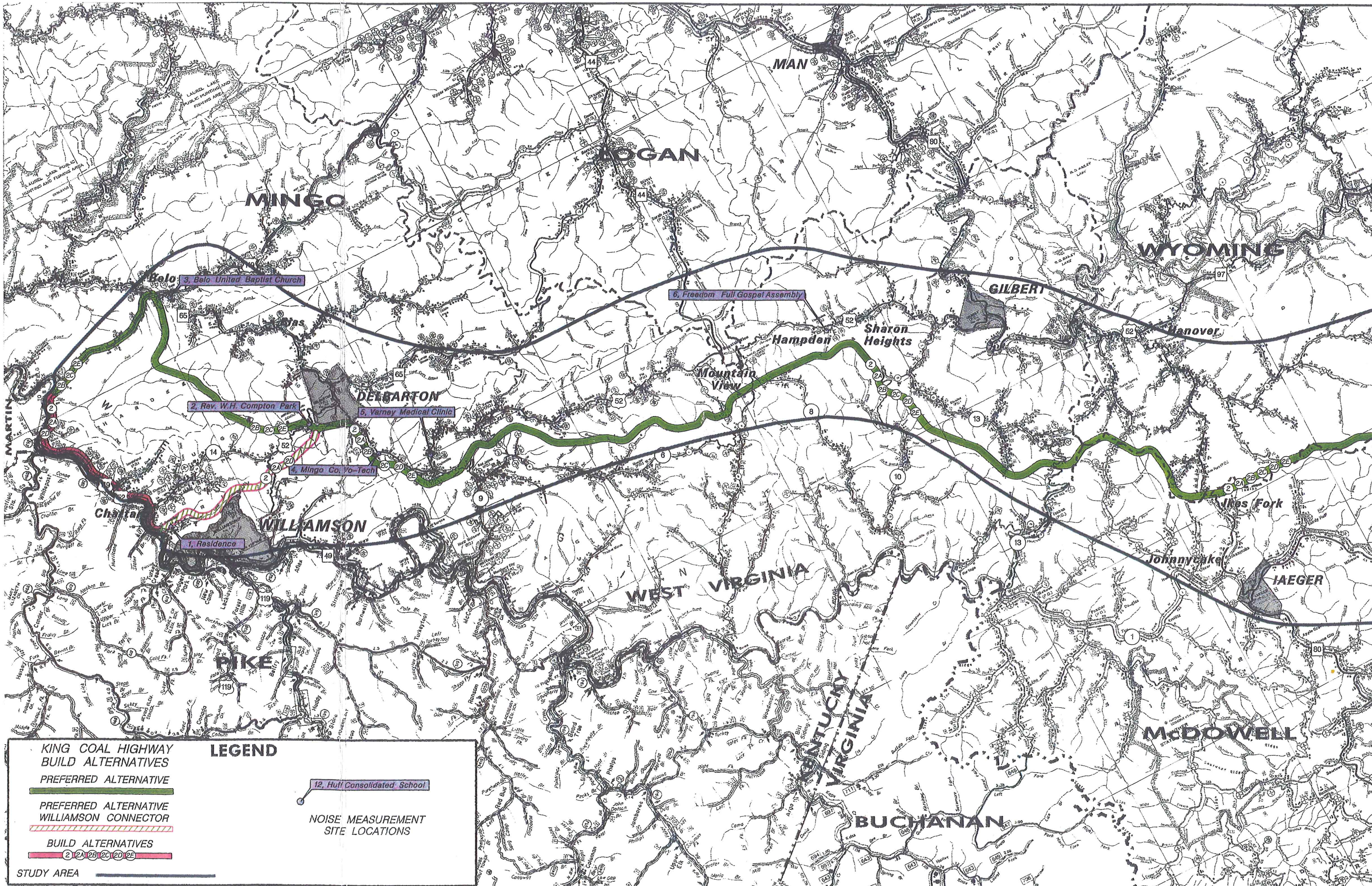


Exhibit III-6

KING COAL HIGHWAY

MINES


MINGO
LOGAN
MAN
WYOMING
GILBERT
Hanover
Belo
3, Belo United Baptist Church
6, Freedom Full Gospel Assembly
Hampden
Sharon Heights
Mountain View
DELBARTON
2, Rev. W.H. Compton Park
5, Varney Medical Clinic
4, Mingo Co. Vo-Tech
1, Residence
WILLIAMSON
Chattaroy
Ikes Fork
Johnnycake
IAEGER
MARTIN
WEST VIRGINIA
KENTUCKY
VIRGINIA
PIKE
BUCHANAN
McDOWELL
LEGEND
KING COAL HIGHWAY BUILD ALTERNATIVES
PREFERRED ALTERNATIVE
PREFERRED ALTERNATIVE WILLIAMSON CONNECTOR
BUILD ALTERNATIVES
2 2A 2B 2C 2D 2E
STUDY AREA
12, Huff Consolidated School
NOISE MEASUREMENT SITE LOCATIONS

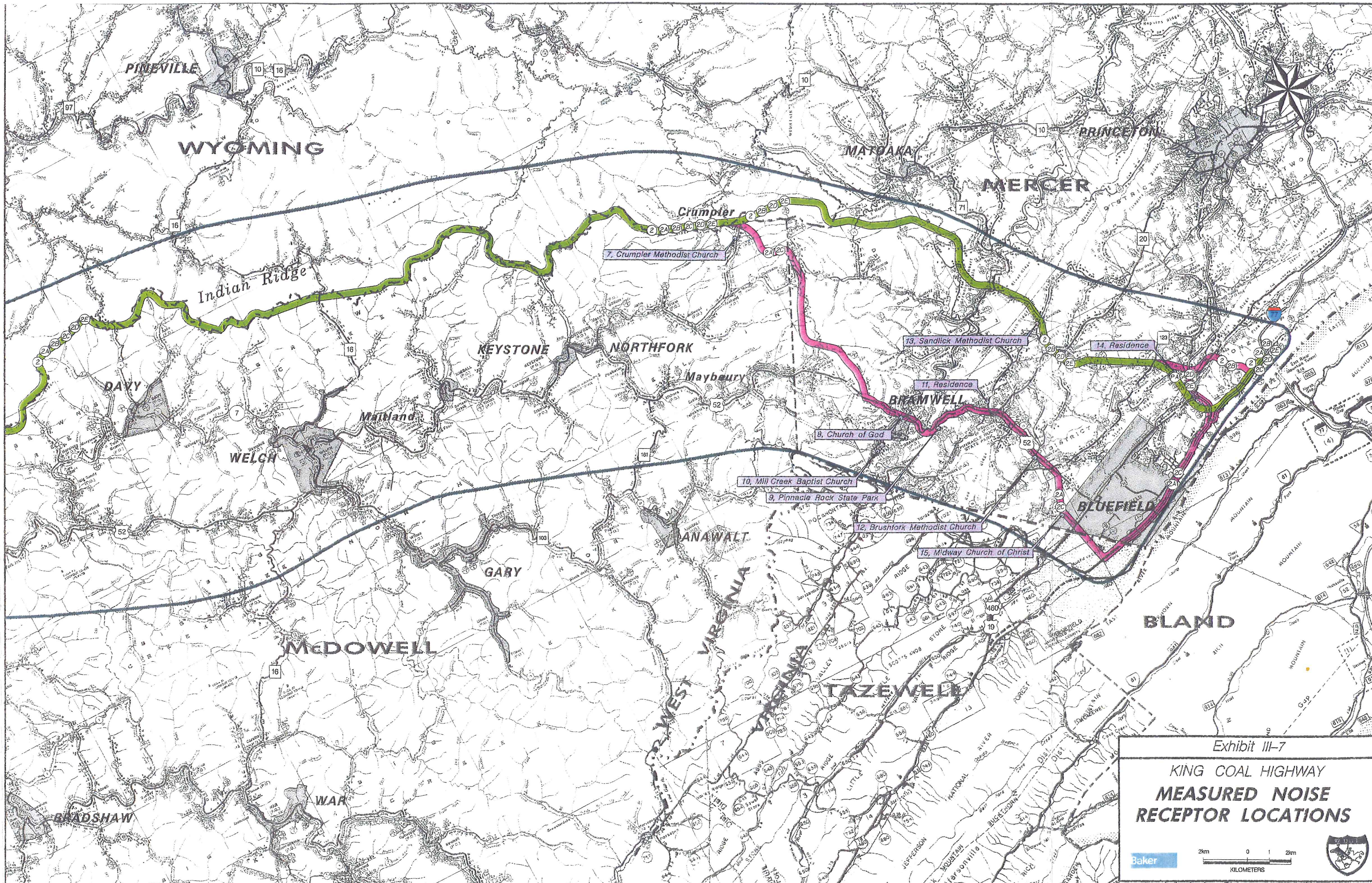


Exhibit III-7

KING COAL HIGHWAY

MEASURED NOISE RECEPTOR LOCATIONS

SECTION IV: ENVIRONMENTAL CONSEQUENCES

This section presents the anticipated environmental consequences of the Build Alternatives. Six Build Alternatives 300 meters (984 feet) wide were assessed for impacts which are anticipated to occur from construction of the King Coal Highway. These impacts serve as a basis for comparison of the Build Alternatives and assisted in the identification of the Preferred Alternative.

The methodologies used to assess impacts are those currently recognized by regulatory agencies and/or prescribed by FHWA or WVDOT. Condensed methodology descriptions are provided below. Detailed information can be found in the supporting technical appendices (Volumes 1 and 2). The following sections focus on the measurable impacts of the PA and Build Alternatives. Secondary and cumulative effects are discussed where appropriate.

4.1 LAND USE AND LAND COVER

4.1.1 METHODOLOGY

Current land use and land cover in the study area were analyzed in order to assess potential impacts of land use and land cover conversion due to each Build Alternative. Existing land use and land cover classifications were determined using quadrangles from the USGS 7.5 minute map series with determinations verified through field reconnaissance and aerial photointerpretation. Land use and land cover classifications within the Build Alternatives are based on Anderson Land Use and Land Cover Classifications (Anderson et al., 1976). Because of the limited diversity of land use and land cover within the study area, some of the classifications were grouped together. Urban/Built Land is a grouping of the following land uses: Residential; Commercial and Services; Transportation, Communication, and Utilities; Industrial; Mixed Urban or Built-Up Land; and Other Urban or Built-Up Land. Forested Land is a consolidation of Deciduous Forest Land, Evergreen Forest, and Mixed Forested Land.

Economic constraints such as water and sewer service, land availability, and land suitability (proximity to population centers and access to consumers) can affect potential growth areas (Region I Council, 1995). Utilities were used as primary indicators of areas that could potentially experience residential, commercial, or industrial growth. Utilities that are in place, or could be installed efficiently, are an incentive for people and businesses to move into an area. Water and sewer services are the most limiting utilities in the study area. Their accessibility was used as an indicator for areas that were likely to accommodate growth. Future land use patterns were estimated by examining access to utilities and reviewing past development trends, and discussing development plans and opportunities with planners in the corridor.

4.1.2 IMPACT ASSESSMENT

4.1.2.1 Impacts To Existing Land Use And Land Cover

Each Build Alternative will affect the current land use and land cover within the study area. The hectares (acres) of each land use and land cover classification that will be converted from its present designation are presented in Table IV-1 for each Build Alternative. Forested Land is approximately 88 percent of the land cover within the Build

Alternatives (Exhibit III-1). The predominant land use is Urban/Built; Alternative 2A has the most Urban/Built land use. The Forested Land portion of total land cover is greatest in Alternatives 2B and 2C. The Cropland/Pasture and Transitional land covers are minimal in comparison to the Forested Land and Urban/Built land covers/uses.

TABLE IV-1
LAND USE AND LAND COVER

Build Alternative	Urban / Built Hectares (Acres)	Forested Land Hectares (Acres)	Cropland and Pasture Hectares (Acres)	Transitional Hectares (Acres)	Strip Mines, Quarries, Gravel Pits Hectares (Acres)
2	212 (525)	3,735 (9,226)	140 (346)	70 (174)	114 (282)
2A	316 (781)	3,709 (9,162)	70 (172)	65 (162)	36 (88)
2B	69 (170)	3,876 (9,572)	140 (346)	70 (174)	36 (88)
2C	255 (631)	3,849 (9,508)	70 (172)	65 (162)	36 (88)
2D	234 (578)	3,649 (9,016)	107 (266)	70 (174)	114 (282)
2E	90 (222)	3,788 (9,361)	111 (275)	70 (174)	36 (88)
PA	159 (393)	3,760 (9291)	101 (250)	71 (175)	114 (282)

4.1.2.2 Secondary And Cumulative Impacts To Future Land Use And Development

One potential impact of the Build Alternatives is the conversion of land to areas of development. The Build Alternatives could affect land use by improving access to the study area. This improved access may stimulate and accelerate development opportunities in areas that were once considered too remote for development. The following sections discuss the likely locations of new development, a comparison of Build Alternatives relative to potential growth areas, cumulative land use impacts, and the consistency of this potential development with local plans.

Land Use Impacts

The potential impact associated with all of the Build Alternatives on areas of potential growth is improved access. Improved access can stimulate the economy and therefore increase the likelihood of development throughout the study area.

Three types of development, each with different location criteria, will potentially result from improved access. They are: industrial/institutional; residential; and commercial development.

Industrial/Institutional Development is likely to occur where transportation access, public utilities and sufficient flat land are available. Increasingly, industries also seek prepared sites. The primary prepared site in the study corridor is the McDowell

County Industrial Park (Indian Ridge Industrial Park), which would be adjacent to the Preferred Alternative.

This (Indian Ridge Industrial Park) major industrial park is advancing rapidly, making it possible to discuss environmental impacts of the anticipated secondary development. The Industrial park was located on Indian Ridge as a result of a county-wide search by McDowell County for a feasible site to develop sufficient flat land for industrial development. The site was chosen for numerous reasons, including feasibility of acquisition, financing, provision of services, and excavation. The site includes former mines and a landfill, and is currently served by existing WV 16. The location of the Preferred Alternative for King Coal Highway was not known at the time the site was chosen. The Coalfields Expressway Authority, the DOH, and the McDowell County Commission have worked together to ensure that the objectives of the major public investments in the area (i.e., Coalfields Expressway, King Coal Highway, and the Indian Ridge Industrial Park) would not be compromised, particularly once it became apparent that the Coalfields Expressway/King Coal Highway interchange might use a portion of the Indian Ridge site. The Indian Ridge industrial park has completed financing and provision of sewer, electric, and gas utilities to the site. Water lines will be extended to the site in the near future. Plans are also established for a federal prison and a hotel for phases I and II of the industrial park. A U.S. Senate appropriation for the federal prison has already passed.

Thus, Indian Ridge Industrial Park is not dependent on the King Coal Highway. The Industrial Park's ultimate development, however, is likely to occur more quickly and with higher quality development if it is served by a four-lane highway. While the Coalfields Expressway would also serve this purpose, the general, anticipated development impacts of the Indian Ridge Industrial Park are discussed below.

The initial portion of the project, phases I and II, will produce approximately 326.8 acres of flat land, with approximately 60 acres to be taken up by the two proposed highway projects (King Coal Highway and Coalfields Expressway). The primary potential environmental impacts are the filling of streams in the Tug Fork watershed and removal of potential roosting trees (PRTs) of the endangered Indiana Bat. Prior to constructing each phase, sediment control/stormwater retention structures will be constructed in the valleys below all proposed disturbance. These retention ponds will be permanent mitigation for stream impacts of the project. Mist-netting for the Indiana Bat was conducted by McDowell County in 1999, and the site was cleared for this species (Section 7 consultation).

Industrial parks near but outside the study area also may benefit from the Build Alternatives, such as those along I-77 north of Princeton and in Bland County, Virginia. Because of terrain constraints, few additional sites are feasible for large-scale industrial development.

A secondary impacts evaluation was conducted focusing on the potential for coal companies mining "new" areas that, without the highway facility, would not be mined. In summary, there are a multitude of variables that dictate the practicability and profitability to mine coal. Variables (not a complete list), independent of the construction and use of a new highway facility, can include factors such as market demand for coal and value-added coal products, cost of fuel, labor costs, type of mining, coal seam quality, current and planned mineral rights, federal and state legislation, and national security interests. Ultimately, it is up to the discretion of coal operators what areas will be mined and when. Construction of the King Coal Highway will not facilitate mining in areas that are not already planned to be mined, but perhaps the sequence in which they will be mined. However, this is not a secondary impact.

Lastly, factors and events far removed from the study area can dictate the economic viability to mine coal. For example, if energy prices rise or events that negatively impact the oil industry (e.g., act of war) were to occur, coal reserves that were previously not economically viable to mine may become profitable to mine. Thus, the relationship between the construction and use of a new highway facility and the secondary impact of mining "new" areas is not a functional relationship due to the multitude of factors that determine the profitability of extracting mineral reserves at any given time.

Commercial Development will be attracted to new, high-traffic areas. In the short-term, new interchanges will be the prime attractors of this development, so the location of new interchanges will determine to a large degree where these land use impacts will occur. These areas could include US 52 on both sides of Williamson and on the McDowell/Wyoming county line, WV Rt. 16, and US Routes 19 and 460. Eventually, commercial development also will be stimulated by overall industrial and residential growth in the study area, as well as any increase in tourism within the region. The locations of new commercial development will be determined by highway access limitations and availability of suitable land. Topography is a major constraint, and likely would limit any new, large-scale commercial development (such as a shopping mall) to Mercer County. The topography constraint could work in favor of the existing downtown areas in the study corridor, whose long-term sustainability would be enhanced by commercial growth as long as new commercial developments do not develop outside of town and draw businesses away from downtown areas.

Residential Development requires access to jobs, relatively flat land, and is more likely to occur in areas with water service. Residential development is likely to be stimulated in areas near new and existing employment centers. There are numerous abandoned home sites in the corridor that would be suitable for new construction, and the development of completely new subdivisions is also likely. Throughout the corridor, water service is available to most settlements along the roads and river valleys, and many of these areas also have sewer service. The improved accessibility from McDowell County to the Bluefield area and to industrial employment in nearby parts of Virginia is likely to stimulate residential development, particularly in western Mercer County. New jobs in the center of the corridor (from the industrial park and proposed prison) could stimulate new residential development in locations throughout the corridor.

Forecasts of employment and population for this area are not available; the West Virginia University Center for Economic Research has ceased publishing the existing forecasts, which clearly do not reflect the latest trends in this region. As a result, it is not possible to quantify the amount of development that would occur with and without the Build Alternatives in this corridor. However, given the planning and public investments in infrastructure in the region, combined with the dramatic change in accessibility associated with the Build Alternatives, it is reasonable to assume that further stabilization and reversal of declines in population and employment would likely be the outcome of building the proposed highway.

Without the highway, industrial and commercial growth in the study corridor likely would be hampered by the lack of accessibility. If this job growth were not to occur, the population growth in these areas of the corridor also would likely be considerably less if the King Coal Highway were not built. A study of Appalachian Development Highways and related investments made under the Appalachian Regional Commission, indicates that the economic impact of these investments increases with the distance from a city of 25,000 or more population (Isserman and Rephann, 1995). This suggests that economic growth in the northern end of the study corridor is more likely to depend on a transportation investment such as the King Coal Highway.

Potential Growth Areas

The potential impact associated with all of the Build Alternatives on areas of potential growth is improved access. Improved access can stimulate the economy and therefore increase the likelihood of development throughout the study area. Table IV-2 provides the number of potential growth areas accessed by each Build Alternative. Exhibit III-2 illustrates the potential growth areas located within the Build Alternatives.

TABLE IV-2
POTENTIAL GROWTH AREAS

Build Alternative	Number of Growth Areas Accessed
2	7
2A	6
2B	6
2C	5
2D	7
2E	6
PA	7

There is no substantial difference in the number of potential growth areas accessed by each Build Alternative. The Build Alternatives are located on ridge tops where water and sewer services are not provided. The low number of potential growth areas accessed by the Build Alternatives is due to the lack of easily accessible water and sewer services directly within the alignments. Secondary growth opportunities exist where these services are provided elsewhere along the roads that intersect with the Build Alternatives.

Cumulative Land Use Impacts

The King Coal Highway is part of a larger, national corridor (I-73/I-74) from South Carolina to the Great Lakes region. Also, other planned projects in West Virginia will intersect with the King Coal Highway: the proposed Coalfields Expressway and the proposed Shawnee Highway. In addition to these transportation investments, extensive public investments in water and sewer system capacity are occurring within the study area. All of these investments combined will increase the impacts of each individual investment. Specifically, the King Coal highway will provide greatly improved inter-state access to southern West Virginia because of its linkage to the other segments of the I-73/I-74 corridor. At the same time, the Coalfields Expressway and Shawnee Highways, which are roughly perpendicular to King Coal, will extend the benefits of King Coal to a much broader area of southern West Virginia. The counties of this region are also actively investing in water and sewer systems, including extending these services to new areas and upgrading existing systems. With these services in place, private investment in development will be facilitated.

Consistency With Comprehensive Development Plans

Land use plans and controls can affect Build Alternative location and determine potential growth areas. However at this time Bluefield, West Virginia is the only community in the study area with a zoning plan. The King Coal Highway is identified specifically in the Region I Planning and Development Council's *Regional Development Plan* (1990). Several transportation improvements, including the King Coal Highway, are indicated as one of the three factors in the continuation of economic progress in the counties that the Development Council represents (i.e. Mercer, Wyoming, McDowell, Raleigh, Monroe, and Summers). (Other factors critical to economic growth and a high quality of life are infrastructure development and positive business enhancements [Region I Council, 1990].) In the Region II Planning and Development Council's *Regional Development Plan* (1992), transportation access in the study area is identified as a needed improvement. The plan also states specifically that "Improved access from small towns in the region to the main highways is critical to development" (Region II, 1992). Therefore, the King Coal Highway is consistent with the local comprehensive development plans.

4.2 SOCIAL ENVIRONMENT

4.2.1 METHODOLOGY

Baseline information was obtained from the U.S. Bureau of the Census, West Virginia University's Center of Business and Economics, West Virginia Department of Education, Region I and II Planning and Development Councils, Mingo County Redevelopment Authority, and a survey of health care providers in all study area counties.

4.2.2 IMPACT ASSESSMENT

4.2.2.1 Community Cohesion

A limited access highway can be a physical barrier to local transportation as well as a psychological barrier to communication and community activity. However, lack of efficient transportation facilities can decrease the access to communities and therefore increase isolation. Because of increasing centralization and consolidation of services (e.g. schools, medical care), access is becoming more essential to the communities.

The No Build Alternative will continue to impede community access to and from emergency services, schools, and other facilities. The poor level of service (LOS) that the study route currently provides, and will provide in the future, will continue to increase response times of ambulance, police, and fire services.

The construction of the King Coal Highway could serve to increase community cohesion, by increasing access to facilities. However, accessibility could also be potentially limited. For example, due to the topography of the area, access to a narrow valley could be limited by the placement of a Build Alternative.

There are over 100 incorporated and unincorporated communities within the study area. Of these communities, 16 are located within the Build Alternatives (Table IV-3). The 16 communities are located in Mingo, Mercer, and Tazewell counties. The PA affects 10 of these communities.

Within the communities that are crossed by the PA, there could be impacts to pedestrian access. Community cohesion would be affected if pedestrian access within a community were reduced, in effect dividing the community. As discussed further in section 4.6. Bicycle and Pedestrian Trails, careful attention to this type of impact will be given during the design phase of the project.

4.2.2.2 Community Services And Public Safety

The locations of community service and public safety facilities affected by the Build Alternatives are identified in Exhibit III-3.

Community services will be temporarily affected during the construction of any of the Build Alternatives. The long-term effects of the construction of any of the Build Alternatives will be beneficial to community services and public safety. The construction of the King Coal Highway will lead to decreased response times for fire, police, and EMS, and decreased travel times for schools.

TABLE IV-3
COMMUNITIES WITHIN THE BUILD ALTERNATIVES

County	Communities	Build Alternatives	Access Required to:
Mingo, WV	Goodman	2B, 2C, 2E, *PA	County 52/9
	Belo	2, 2A, 2D, PA	US 119
	Chatteroy	2, 2A, 2D, *PA	County 14
	Borderland	All Alternatives	County 52/10, County 52/37
	Hatfield	2, 2A, 2D, PA	US 52
	Nolan	2, 2A, 2D, PA	US 52
	DELBARTON	2, 2A, 2D, PA	WV 65
Mercer, WV	BRAMWELL	2A , 2C	County 120
	Bluewell	2A, 2C	WV 71, County 20
	Sandlick	2A, 2C	County 71/5, County 71/13
	Ada	2A, 2C	WV 112
	Stony Gap	2A, 2C	County 25
	BLUEFIELD	2A, 2C	US 52, US 19
	Brushfork	2, 2B, 2D, 2E, PA	WV 123
	Midway	2, 2B, 2D, 2E, PA	County 11
Tazewell, VA	BLUEFIELD	2A, 2C	US 460

Sources: County Highway Maps; Field Views, 1995. Note: INCORPORATED; Unincorporated. *Williamson Connector portion of the PA. There are no communities within the Build Alternatives in Logan, McDowell, or Wyoming counties.

Also, there will be better access to health care facilities. All of the Build Alternatives will provide improved access to community facilities.

4.2.3 MITIGATION

Mitigation of short-term negative impacts of construction include prudent scheduling and programming of the various phases of construction and the provision of construction detours, informative signing, and maintenance of access. It is the policy of WVDOT to maintain access to homes, farms, businesses, and community facilities where practicable. Public safety service providers will be kept fully aware of project scheduling, planned road closings, and alternative route designations. All emergency agencies and schools will be informed regularly of temporary detour routes or areas of potential delays during construction.

Final design of the project also will attempt to mitigate direct neighborhood impacts, if necessary, through minor, local changes in alignment and alterations to the typical section such as median reduction and/or use of retaining walls.

Mitigation measures which will be implemented to overcome the barrier effect of a four-lane divided highway include overpasses and walkways. A primary design goal could be to ensure that no area experiences a decrease in access and mobility as a result of the highway.

4.3 ECONOMIC ENVIRONMENT

4.3.1 METHODOLOGY

Baseline information was obtained from the U.S. Department of Commerce - Bureau of the Census, West Virginia University's Center of Business and Economics, and West Virginia Bureau of Mining, Office of Mine Safety. The economic characteristics analyzed were: economic activity, employment, and income. More specifically, the economic indicators used were: employment by Standard Industrial Classification (SIC) code, unemployment, population in the labor force, population in poverty, and transfer payments received by households.

4.3.2 IMPACT ASSESSMENT

4.3.2.1 Economic Activity

Economic activity in the study area will be affected by the Build Alternatives. Transportation access to the area will be improved using the Build Alternatives. Better access could also benefit the study area's economy. Businesses will be more likely to locate in an area that has an adequate transportation system. Nevertheless, access alone is not the answer to economic improvement. Other factors may be critical to business location, such as the strength and knowledge of the work force, resources and materials the area has to offer, and presence of other types of businesses needed for delivery of goods and services. Transportation related businesses may see an increase in commerce because of the King Coal Highway, but this may depend on location and on the movement of other businesses into the study area.

4.3.2.2 Employment

Within the study area there are several major employers (e.g. coal mines, municipalities, retail establishments). Major employers are defined as individual establishments with approximately 50 or more employees, or distinct geographic areas (i.e. Welch) with 50 or more people employed within the incorporated limits. The majority of the employers are larger towns where 50 people or more are traveling to the town and their place of work. Isolated employers tend to be coal mines. The mining industry contributes the largest proportion to personal income in all of the study area counties. Services, particularly health services, and government enterprises contribute a greater amount of earnings in Mercer County, West Virginia (Center for Economic Research, 1993). Access to mining, services, and government were considered in the identification of the Preferred Alternative. However, these considerations must be weighed against displacement impacts.

Major employers in the area were analyzed to determine how many would be directly accessed by each of the Build Alternatives (Table IV-4). The locations and identification of major employers are illustrated in Exhibit IV-1. The Preferred Alternative will provide direct access to eight major employers.

TABLE IV-4
MAJOR EMPLOYERS

Build Alternative	Number of Major Employers Accessed
2	8
2A	10
2B	7
2C	9
2D	8
2E	7
PA	8

4.4 DISPLACEMENTS

4.4.1 METHODOLOGY

Each of the Build Alternatives will require the taking of real estate and the displacement of residents, businesses, and other facilities or structures. The displacement assessment was completed in accordance with Title VI of the Civil Rights Act of 1964, as amended in 1968. Displacements within the Build Alternatives were identified through inspection of USGS 7.5 minute map series. The number of residences, businesses, and other facilities were calculated for each Build Alternative. Recreational resources within the Build Alternatives were identified through information from the Region I Planning and Development Council, West Virginia Development Office - Community Development Division, National Park Service, County Highway Maps, and USGS 7.5 minute map series. Information was updated through field reviews and aerial photointerpretation (March, 1995).

4.4.1.1 Special Groups

Special groups (e.g. elderly, handicapped, ethnic groups, non drivers) affected by each of the Build Alternatives were identified. Special groups information was obtained from the U.S. Census Bureau and analyzed by BNA and by place to gain information on a more specific geographic area than the county level. These groups are defined as those which have the potential to be specially benefited or harmed by the proposed project. Only one special group, the elderly (those over 65 years of age), was identified in the study area. Identification of special groups is consistent with FHWA Technical Advisory T 6640.8A (USDOT, 1987).

4.4.2 IMPACT ASSESSMENT

4.4.2.1 Residential and Business Displacements

Alternatives 2A and 2C would potentially displace the greatest number of residences and businesses of the six Build Alternatives and the PA (Table IV-5). The majority of the residential and business displacements would occur in Mercer County where Alternatives 2A and 2C follow US 52. Residential and business displacements associated with Alternatives 2, 2B, 2D 2E and the PA are also greater in Mercer County between the Wyoming/Mercer county line and US 52

TABLE IV-5
DISPLACEMENTS WITHIN BUILD ALTERNATIVES

Build Alternative	Total Displacements	Residences	Businesses	Community Facilities
2	283	256	13	14
2A	879	727	120	32
2B	290	267	9	14
2C	886	738	116	32
2D	244	220	12	12
2E	251	231	8	12
PA	295	277	7	11

Note: Community facilities include recreational parks, schools, cemeteries, health centers, churches, fire departments, Head Start centers, public libraries, post offices, and police departments.

4.4.2.2 Public Recreational Areas and Community Facilities Displacements

The community facilities located within the Build Alternatives include cemeteries, churches, a school, recreational parks, and a fire department. The recreational parks in the Build Alternatives include neighborhood parks, athletic facilities, playgrounds, baseball fields, and Pinnacle Rock State Park (Table IV-6). Alternatives 2A and 2C will impact the greatest number of community facilities and public recreational areas (Table IV-5 and IV-6). The PA will impact the lowest number of community facilities and will not impact any public recreational parks.

TABLE IV-6
PUBLIC RECREATIONAL PARKS WITHIN BUILD ALTERNATIVES

Resource	Types of Facilities	Owner	Community/ Location	Within Alternatives:
Bluefield College	Ball Fields	Bluefield College	Bluefield, VA	2A and 2C
Midway Park	Playground	City of Bluefield, WV	Midway, WV	2A and 2C
Pinnacle Rock State Park	Scenic Overlook, Trails, Picnic Facilities	State of West Virginia	Bramwell, WV	2A and 2C

4.4.2.3 Special Groups

Only one special group, the elderly (those over 65 years of age), was identified in the study area. Through Census data analysis, elderly populations within communities impacted by the Build Alternatives were identified (Table IV-7). The communities with elderly populations are associated with Alternatives 2A and 2C. No special groups were identified within the PA. While no other special groups as defined for displacements were found in the Build Alternatives, impacts to low income and minority groups are discussed under Environmental Justice.

TABLE IV-7
ELDERLY POPULATIONS

County	Community	Percent of Population Within the Community Over 65	Within Alternatives:
Mercer, WV	Bramwell	21.0%	2A, 2C
Mercer, WV	Bluefield	22.4%	2A, 2C

Source: U.S. Department of Commerce, 1992a and 1992b.

4.4.3 MITIGATION

Minimization of displacement impacts will be incorporated into the final highway design. Where avoidance is not possible, acquisition and relocation will proceed in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Relocation resources will be made available to all residents and businesses without discrimination.

Housing data indicate that vacancy rates in the study area range from 10 to 16 percent. Detailed information on housing characteristics is given in the accompanying Technical Report, *Volume I: Traffic/Transportation, Natural, and Physical Environment (Appendix B).* These data suggest that sufficient housing is available within the study corridor to accommodate the displacements of the Preferred Alternative. More recent review of real estate data suggests, however, that relocation in Mingo, McDowell and Wyoming Counties may be constrained by available housing. If so, the Department of Highways will utilize a Last Resort Housing program to provide adequate housing, and replacement housing will be in place and made available to all affected persons prior to construction.

All residents and businesses that are relocated will be provided with fair market value for their property and will be offered decent, safe, and sanitary replacement housing or suitable replacement business sites and facilities. Relocation procedures will be implemented in accordance with the WVDOH Brochure: *Relocation Assistance, Moving Costs, Replacement Housing, Appeals,* December, 1990.

All state and federal relocation laws and regulations will be adhered to. WVDOH and FHWA policy regarding relocation notes the following:

- No person shall be displaced by construction projects unless and until adequate replacement housing has been made available to all affected persons regardless of their race, color, religion, sex, or national origin. All actions will comply with the Civil Rights Act of 1964.
- Services and payments shall be provided to all relocatees within the limits of laws and administration procedures established by the State.
- To the greatest extent practicable, no person lawfully occupying real property shall be required to move from his dwelling or to move his business, farm operation or non-profit organization without written notice of at least 90 days prior to the date such a move is required.
- A right-of-way representative will be available to assist residents in relocation.

In instances where dwellings that pass the State's criteria for decent, safe and sanitary are not readily available, the WVDOH will institute a Last Resort Housing Program. This involves locating comparable housing sites within the same county and, through a contractor bidding process, determining the replacement cost of the displaced housing. (The bids represent the cost of constructing a new home of comparable size.) Displaced home owners will be offered the replacement cost of their housing on this basis, and the State will oversee the construction of replacement housing if the displacee so desires. In southern West Virginia, other DOH relocation programs in similar circumstances have resulted in a small number of replacement homes being constructed and a large number of homeowners accepting the replacement housing payment to purchase and improve a dwelling that was available, though not on the real estate market. For example, Corridor G in Mingo County displaced 125 homes in the Nolan area: all qualified for last resort housing, but only 15 last resort homes were built; the remaining 110 families successfully relocated within Mingo County using the replacement housing payment. Tenants who are displaced may have the most difficulty finding comparable rental dwellings. However, under the Last Resort Housing Program, ownership is an option for these families through a settlement that is sufficient for a mobile home or similar situation that is affordable in terms of monthly expenses after relocation.

4.5 ENVIRONMENTAL JUSTICE

4.5.1 METHODOLOGY

Presidential Executive Order 12898 (1994) states that disproportionately high and adverse human health and environmental effects to low-income and minority populations must be identified and taken into consideration for federal projects if impacts to these communities are disproportionately high.

Low-income groups are defined as people "whose household income is below the Department of Health and Human Services poverty guidelines" (USDOT, 1995). Poverty statistics from the U.S. Census are based on "the standard to be used by federal agencies for statistical purposes" (U.S. Department of Commerce 1992a). Originally, the U.S. Department of Agriculture determined that a typical family of three spent one-third of their income on food. Thus, the poverty level was set at three times the cost of a government economy food plan. This has been adjusted over time and can be adjusted for family size (U.S. Department of Commerce, 1992a and 1992b). The average poverty threshold for a family of four in the United States in 1990 was $12,674. Additionally, for this project, low-income populations include people that receive public assistance income such as transfer payments.

The 1990 U. S. Census divides the population into five categories: American Indian/Eskimo/Aleut, Asian/Pacific Islander, Black, Other, and White. All categories except White were combined to form the minority population.

Baseline information on low-income and minority populations was obtained from the U.S. Department of Commerce - Bureau of the Census. Population indicators used were: minority populations, population in poverty, and households receiving public assistance income. These populations were analyzed by BNA to gain information on a more specific geographic area than the county level. The BNAs that have a 25 percent higher population of low-income or minority populations than their respective counties are considered low-income or minority BNAs.

4.5.2 IMPACT ASSESSMENT

4.5.2.1 Low-Income

In the West Virginia counties of the study area, the percentage of the population in poverty is higher than the state percentage (see Table III-7). Additionally, one-third of the BNAs in the study area have a poverty rate higher than that for their respective counties.

The percentage of households receiving public assistance income in the form of transfer payments (non-wage or salary income) varies over the study area. All study area counties have a higher percentage of households receiving public assistance than their respective states in 1990 than in 1980 (see Table III-9).

Based on the economic conditions of the study area, the Build Alternatives will not have disproportionately high impacts to low-income populations. Of the eight communities where the poverty rate of the local population exceeds the average poverty rate of the respective counties (see Table III-8), only two communities will be directly impacted by the Build Alternatives (Table IV-8). Bramwell in Mercer County and Delbarton in Mingo County are located within Alternatives 2A and 2C. Delbarton is the only community affected by all Build Alternatives. The community of Delbarton was evaluated for potential disproportionate impacts as a result of the project on low-income communities. Results of this investigation provided the following results: Delbarton is a small town of about 500 homes; Delbarton does not have any public assistance housing or apartment complexes; the only rentals within Delbarton are private homes; Delbarton does not have any mobile home parks; and, the Street corner surveys did not identify any neighborhood concentrations of low-income residents. Thus, no disproportionate impacts on low income communities are anticipated for Delbarton.

TABLE IV-8
ENVIRONMENTAL JUSTICE

County	Community	Low-Income Population Within the Community	Minority Population Within the Community	Within Alternatives:
Mingo, WV	Delbarton	Yes	No	All
Mercer, WV	Bramwell	Yes	Yes	2A, 2C
Mercer, WV	Bluefield	No	Yes	2A, 2C

4.5.2.2 Minority Populations

Population statistics for 1990 show that over 94 percent of the population in the study area was White and five percent of the population consisted of minorities. Noted minority populations are located in seven communities within the study area (see Table III-12). Two of the seven communities are impacted by Alternatives 2A and 2C (Table IV-8). These communities are Bramwell and Bluefield. The PA has no environmental justice impacts for minority populations.

4.5.3 MITIGATION

Minimization of displacement impacts will be incorporated into the final highway design. Where avoidance is not possible, acquisition and relocation will proceed in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Relocation resources are made available to all residents and businesses without discrimination.

4.6 BICYCLE AND PEDESTRIAN TRAILS

4.6.1 METHODOLOGY

The WVDOH, in cooperation with FHWA, has adopted the *Statewide Plan for Accommodation of Bicycle Transportation and Pedestrian Walkways* (Draft DD-813, Bicycle/Pedestrian Accommodation, November 18, 1998). It is now the policy of the WVDOH that during design of all highway construction projects, consideration will be given, as outlined herein, for the incorporation of facilities for the accommodation of bicyclists and pedestrians. During the environmental review/planning process, the study area was reviewed for pedestrian walkway facilities, designated bikeways, scenic trails and proposed trails to identify any areas where the alternatives may impact such facilities.

4.6.2 IMPACT ASSESSMENT

Research confirmed that there are no bikeways currently in the study area or the surrounding area. Nor are there any exclusive bikeways or hiking trails planned for this area.

Currently, there are areas in which pedestrians cross existing roadways. These areas are isolated areas associated with pedestrians crossing the street to get between facilities such as retail and employment centers. This movement primarily takes place within the towns located along the study route. These pedestrian movements may be inhibited by the Build Alternatives.

4.6.3 MITIGATION

At this time, there are no known pedestrian walkway facilities and bicycle facilities that will be impacted by the PA or any of the Build Alternatives. If, during the final design process, any pedestrian or bikeway facility is identified and potentially impacted, it will be mitigated by providing opportunities to improve bicycle and pedestrian-oriented movements. As more detailed design plans are developed, opportunities to provide access to pedestrian walkways and bikeway facilities will be in accordance with statewide plan for accommodation of bicycle transportation and pedestrian walkways (Draft DD-813,1998). If, during the final design stages of the PA when the alignment is set, it is determined that the PA segregates facilities that generate pedestrian traffic (for example a parking lot and a retail shopping center), then overpasses and walkways will be constructed to overcome the barrier effect of a four-lane divided highway and to ensure pedestrian safety. The locations of these walkways will be determined once right-of-way has been established.

4.7 FARMLANDS

4.7.1 METHODOLOGY

Coordination was initiated with the Natural Resources Conservation Service (NRCS) Morgantown, West Virginia office and the NRCS Russell County, Virginia office. NRCS soil surveys and county-wide listings of prime, unique, state-wide important, and locally important soils were requested from the respective conservationists. Soil surveys for Mingo County, West Virginia and Tazewell County, Virginia have not been published by the NRCS but are in the process of completion. Farmland soils for these counties will be assessed as the soil surveys and soil classifications become available.

Coordination with the appropriate NRCS district offices has also been initiated in an effort to complete the required Farmland Conservation Impact Rating Forms (Form AD-1006). Because Form AD-1006 can only be completed when right-of-way limits have been defined, a modified farmlands assessment was undertaken in consultation with the NRCS Conservationists. The purpose of the modified farmlands evaluation is to ensure that potential effects on farmlands have been taken into consideration during the alternative selection process.

The modified farmlands assessment began with identifying the soil types from the soil surveys which were classified by the NRCS as prime or state-wide important and were within the study area. The number of hectares (acres) of prime and state-wide important farmland soils within each Build Alternative was determined through the use of a Geographic Information System (GIS). Active farms in the Build Alternatives were assessed using aerial photography in order to determine potential project effects on active working farms.

4.7.2 IMPACT ASSESSMENT

4.7.2.1 Farmland Soils

The farmland soils found within each Build Alternative are those that are classified as either prime or state-wide important by the NRCS. Through use of a GIS, the areal coverages (hectares [acres]) of prime and state-wide important farmland soils were determined for each Build Alternative (Table IV-9). Alternatives 2D and 2E impact the least hectares of farmland soils among the Build Alternatives.

4.7.3 ACTIVE FARMS

To determine potential effects of the Build Alternatives on land being used for agricultural purposes, active farms which lie partially or wholly within the Build Alternatives were identified from aerial photography (Table IV-10).

TABLE IV-9
FARMLAND SOILS BY BUILD ALTERNATIVE

Build Alternative	Prime Farmland Soils Hectares (Acres)	State-Wide Important Farmland Soils Hectares (Acres)	Total Farmland Soils Hectares (Acres)
2	2.7 (6.7)	130 (321)	133 (328)
2A	3.0 (7.5)	167 (414)	170 (422)
2B	2.7 (6.7)	130 (321)	133 (328)
2C	3.0 (7.5)	167 (414)	170 (422)
2D	2.7 (6.7)	124 (305)	127 (312)
2E	2.7 (6.7)	124 (305)	127 (312)
PA	3.2 (8.0)	134 (332)	137 (340)

TABLE IV-10
ACTIVE FARMS
WITHIN BUILD ALTERNATIVES

Build Alternative	Number of Farms
2	17
2A	4
2B	17
2C	4
2D	17
2E	17
PA	17

4.7.4 MITIGATION

The NRCS district conservationists have reviewed the Build Alternatives to determine whether any are candidates for protection measures. The Farmland Protection Policy Act (FPPA) states that if the site assessment points for any project alternative is a total score of less than 160 points (from the Form AD-1006), then the site should be given a minimal level of consideration for protection. The NCRS has determined that none of the alternatives would approach a score of 160, so no mitigation is proposed for farmland protection.

4.8 RECREATIONAL RESOURCES

4.8.1 METHODOLOGY

Recreational resources within the PA and Build Alternatives were identified through information from the Region I and Region II Planning and Development Councils, the West Virginia Development Office - Community Development Division, the Virginia Department of Conservation and Recreation, the National Park Service, County Highway Maps, and USGS 7.5 minute series maps.

4.8.2 IMPACT ASSESSMENT

Positive impacts to other recreational resources in the study area are anticipated as a result of improved accessibility to the region as a whole. The Coal Heritage Trail Corridor Management Plan identifies several obstacles to visitor attraction, including congested and/or hazardous road conditions on WV 16 from the McDowell County line south to Welch and on US 52 from Bluewell to Bluefield. The Build Alternatives would enable Heritage Trail visitors to avoid these problem areas, and they would provide an alternate route between the northern and southern sections of the Coal Heritage Trail. The Build Alternatives also would enhance access to the proposed Hatfield-McCoy Recreation Area, which is anticipated to attract over half a million annual visitors to southern West Virginia, Virginia and Kentucky upon completion of the 2,000-mile trail system.

A large portion (35 percent) of the United States population is within a driving day (approximately 500 kilometers [300 miles]) of the study area, which makes the area ideal for development of the tourism industry. This portion of the Unites States includes much of the southeastern and mid-Atlantic states. Marketing within this area is already taking place, for example for the Coal Heritage Trail, and R.D. Bailey Lake in Wyoming and Mingo counties already receives visitors from all 50 states and abroad. The Build Alternatives will dramatically improve access from these tourist markets to the interior of southern West Virginia.

4.8.3 MITIGATION

The general approach to reducing impacts to recreational resources within the study area is to avoid and minimize impacts to the greatest extent possible, then to compensate for any unavoidable impacts. However, no direct impacts to recreation facilities are anticipated within the Preferred Alternative.

4.9 CULTURAL RESOURCES

4.9.1 METHODOLOGY

Federal laws and regulations including Section 106 of the national Historic Preservation Act of 1966, as amended; Section 4(f) of the department of Transportation Act of 1966; and Presidential Executive Order 11593 mandate that sponsoring agencies consider the effects of their actions on significant cultural resources and define the required steps toward this end. Briefly, the laws require that agencies meet their responsibilities by:

- Identifying all cultural resources that may be affected by their actions, through background research and field survey (Phase Ia and Ib, respectively).
- Determining the NRHP eligibility of potentially affected resources and assessing the effect of the project on these resources (Phase II).
- Mitigating adverse effects to NRHP-listed or eligible resources through a program of avoidance (unless there is no prudent and feasible alternative), monitoring, protection, relocation, or data recovery via recordation (for historic resources) and/or excavation (for archaeological sites) (Phase III).

The West Virginia Division of Culture and History (WVDCH) has concurred with the three phase methodology (as described above) for the archaeological resources (Section VII, letter dated July 1, 1997). With respect to Architectural resources, a Determination of Eligibility and Preliminary Effect Assessment Report for the King Coal Highway's Preferred Alternative has been submitted under separate cover to the WVDCH for review and concurrence. The WVDCH has preliminarily determined that the King Coal Highway will have no historic properties adversely affected within the Preferred Alternative (letter dated December, 1999).

The analysis of cultural resource (historic and prehistoric) consisted of a background literature review and examination of the site files curated at the Historic Preservation offices of WVDCH, Charleston, and Virginia Department of Historic Resources (VDHR), Richmond. This research resulted in the preparation of regional prehistoric and historic contexts. This context was presented in the Cultural Resource Technical Appendix (Volume II, December 1999).

A windshield reconnaissance of all architectural resources was conducted within each of the Build Alternatives. Resources over 50 years old, as well modern resources, were photographed, recorded and evaluated for the potential National Register of Historic Places (NRHP) eligibility. For resources within the PA, determinations of eligibility and assessment of adverse effects were conducted.

For archaeological resources, regional archaeological site files and data were used to construct a GIS-based Prehistoric Predictive Model. The model was designed as a preliminary step in identifying areas of high, moderate, and low probability for the presence of prehistoric archaeological sites within each of the Build Alternatives.

Specific resources evaluated for this study are detailed in: a) Cultural Resource Appendix (Volume II). This appendix presents the results of a cultural resource investigation undertaken as part of alternative selection process for the proposed King Coal Highway; b) The Final Determination of Eligibility for Cultural Resources. This report included determinations of eligibility for all potential historic resources within the APE for the Preferred Alternative; c) Final Assessment of Adverse Effects for Historic Properties in the Preferred Alternative.

Pursuant to the provisions of 40 CFR 1502.1, these materials are incorporated by reference into this FEIS. The FHWA will make these materials available for inspection by interested parties.

4.9.2 IMPACT ASSESSMENT

4.9.2.1 Historic Resources

The results of the background research and field survey indicate that the Build Alternatives contain a total of 513 individual architectural resources over 50 years of age (503 in West Virginia and 4 in Virginia), seven potentially eligible individual resources (all in West Virginia) one NRHP-listed historic district (in West Virginia) and one potentially eligible historic district (in West Virginia). These resources include late nineteenth through mid twentieth-century coal and coke-related resources such as mining communities, residences, schools, industrial complexes, and transportation facilities. The locations of the NRHP-listed, eligible, and potentially eligible architectural resources within the Build Alternatives are shown in Exhibit IV-2. Table IV-11a and 11b provides a summary of these resources by Build Alternative. Table IV-11a indicates that the Preferred Alternative contains the fewest potential impacts to architectural resources. The range varies from a minimum of 99 total resources in the Preferred Alternative to a maximum of 433 in Alternative 2A. The Preferred Alternative contains 99 architectural resources over 50 years of age (all located in West Virginia). None of these resources have been previously determined NRHP-eligible by the Keeper of the NRHP.

Based on the determination of eligibility documentation, preliminary assessment of adverse effects documentation, only two individual resources (2 railroad-related resources; KC002-007 and KC028-006) were recommended as potentially individually eligible for the NRHP. It was further concluded, based on the applicable criteria for each resource's eligibility listing, that a "no historic properties adversely affected" determination was appropriate (Table IV-11b; WVDCH letter dated December, 1999). Thus, the Preferred Alternative will not adversely affect any known architectural resources listed or eligible to the NRHP. In accordance with 23 CFR part 771.135, an application of the Section 4(f) criteria is provided in the Appendix of this FEIS. This application finds that no 4(f) use of protected resources occurs with the PA, thus an evaluation of avoidance alternatives is not warranted.

TABLE IV-11A
SUMMARY OF IDENTIFIED HISTORIC ARCHITECTURAL RESOURCES BY BUILD ALTERNATIVE

Historic Resources*	PA **	2	2A	2B	2C	2D	2E	All
Not Eligible	88	110	328	73	291	122	85	399
Potentially Individually Eligible	2	3	5	2	4	3	2	7
Not Contributing to Potential Historic District	0	0	10	0	10	0	0	10
Contributing to Potential Historic District	0	0	78	0	78	0	0	78
Unknown***	9	12	12	12	12	12	12	19
Not Accessible	0	0	0	0	0	0	0	0
TOTAL	99	125	433	87	395	137	99	513
Potentially Eligible Historic Districts	0	0	1	0	1	0	0	1
Eligible Historic Districts	0	0	0	0	0	0	0	0
NRHP-Listed Historic Districts	0	0	1	0	1	0	0	1
Cemeteries****	4	12	17	7	12	12	7	19

*Cultural resources that are immediately adjacent to the Build Alternatives which exhibit a relationship with resources within the Build Alternatives, are included in the table. Cultural Resources within existing four-lane areas are also included in this assessment.

**The Build Alternatives do not include resources within existing four-lane highway sections. These existing four-lane highway sections will not involve new construction and therefore will not have any cultural resource impacts.

***The *Unknown* category includes those resources that are ruins of structures where a NRHP eligibility determination cannot be made without further archaeological investigation.

**** Cemeteries are considered *Not Eligible* under the NRHP Criteria Considerations as an architectural resource and therefore are counted under the Not Eligible category.

TABLE IV-11B
SUMMARY OF ELIGIBLE RESOURCES IN THE
KING COAL HIGHWAY PREFERRED ALTERNATIVE AREA OF POTENTIAL EFFECT

*Resource Number / Name	Estimated Date of Construction	Resource Description	National Register Status/Criterion	Application of Criteria of Adverse Effect
KC002-007- Norfolk & Western Railroad	Ca.1900	Railroad Corridor	Recommended as Potentially Individually Eligible	*No Adverse Effect
KC028-006 -Norfolk & Western Railroad	Ca. 1900	Railroad Corridor	Recommended as Potentially Individually Eligible	*No Adverse Effect

Note: *Results above are based on the *Determination of Eligibility Documentation and Preliminary Effect Assessment for the King Coal Highway Preferred Alternative* (1999). WVDCH letter dated December 1999, Section VII.

4.9.2.2 Archaeological Sites

The results of the background research indicate that there are no previously recorded archaeological sites located within the Build Alternatives. A Prehistoric Predictive Model developed for the project determined areas of High, Moderate, and Low probability land for the presence of prehistoric archaeological sites by Build Alternative. The total hectares (acres) of High, Moderate, and Low probability land for the presence of prehistoric sites by Build Alternative are presented in Table IV-12. The model indicates that Alternative 2E contains the least amount of Moderate and High probability land (299 hectares [738 acres]) while Alternative 2A contains the greatest amount of Moderate and High probability land (404 hectares [1000 acres]).

TABLE IV-12
PREHISTORIC ARCHAEOLOGICAL PROBABILITY AREAS BY BUILD ALTERNATIVE

Build	Probability Areas in Hectares (Acres)		
Alternative	High	Moderate	Low
2	21 (52)	309 (763)	3829 (9,458)
2A	14 (35)	390 (965)	3720 (9,188)
2B	7 (17)	314 (776)	3917 (9,675)
2C	0 (0)	396 (979)	3808 (9,406)
2D	21 (52)	287 (708)	3755 (9,275)
2E	7 (17)	292 (721)	3734 (9,492)
PA	15 (37)	319 (788)	3,885 (9,600)

Prehistoric models are less useful when applied to historic-period sites because historic patterns of settlement are often not driven by ecological factors, but by a medley of cultural and environmental conditions. Historic sites (as well as prehistoric sites) will be identified as part of the Phase I archaeological survey of the Preferred Alternative, once the "construction limits" are established during "preliminary design." Phase I survey, as well as follow-up Phase II and Phase III studies, if warranted, are discussed in the following section.

4.9.3 MITIGATION

Prior to signature of the DEIS in December, 1999, all National Register eligible architectural resources within the Area of Potential Effect of the Preferred Alternative were identified. A final determination of Eligibility report, which summarized the research and included boundary recommendations for all eligible properties was submitted to the WVDCH for concurrence. The WVDCH concurred with the findings of the report (November 1999). Architectural resources that were determined to be NRHP eligible were evaluated for project effects. The results were presented in an Assessment of Adverse Effects Letter Report and submitted to WVDCH for concurrence. The WVSHPO granted concurrence on this evaluation (December 16, 1999). In summary, the Preferred Alternative will have no adverse effect on historic properties. The Advisory Council on Historic Preservation (ACHP) chose not to participate in this project (January 2000).

A programmatic agreement has been executed among FHWA, WVDCH, and WVDOH that commits the WVDOH to a process that will fulfill the requirements of 36 CFR part 800 (see Appendix).

In an effort to plan an effective avoidance or mitigation program for cultural resources, a more detailed cultural resource examination (i.e., systematic archaeological survey) will be conducted within the right-of-way of the Preferred Alternative. Federal laws and regulations including Section 106 of the National Historic Preservation Act of 1966, as amended, Section 4(f) of the Department of Transportation Act of 1966;

Presidential Executive Order 11593, and the regulations of the Advisory Council on Historic Preservation (36 CFR 800), require that sponsoring agencies consider the effects of their actions on significant cultural resources. Briefly, these laws require that agencies meet their responsibilities by:

- Identifying all cultural resources which may be affected by their actions.
- Determining the NRHP eligibility of potentially affected resources and assessing the effect of the project on these resources.
- Mitigating adverse effects to NRHP-listed or eligible resources through a program of avoidance, monitoring, protection, relocation, or data recovery via recordation (historic resources) and/or excavation (archaeological sites).

In cultural resource management, these three steps: identification; eligibility assessment/ determination of effect; and mitigation are commonly referred to as Phase I, Phase II, and Phase III, respectively. An overview of these procedures is provided in the following sections.

Site files maintained at the WVDCH have been examined to update registered archaeological and architectural resource data obtained during the preparation of the DEIS.

When the Preferred Alternatives right-of-way has been established, a Phase I archaeological survey of the Preferred Alternative will be conducted in accordance with current WVDCH guidelines. Areas designated for field survey will be guided by the Predictive Model (for prehistoric sites) and by historic mapping, documentary research, informant data, agency site files information, and relevant architectural survey data.

All recovered prehistoric and historic artifacts will be processed and analyzed for incorporation into a Phase I archaeological report summarizing the results of the field, documentary, and informant research. Archaeological site forms will be submitted to the appropriate state agencies, as required. Artifact curation arrangements will be made with appropriate state repositories for the permanent storage of the artifact assemblages. Recommendations will be made regarding additional work for each identified site.

Because archaeological investigations have not been completed at the time of submission of this FEIS, a Programmatic Agreement has been executed among the FHWA, WVDOH, and WVDCH in compliance with Section 106 of the National Historic Preservation Act (16 U.S.C. 470f), pursuant to 36 CFR Part 800.14. The Programmatic Agreement (see Appendix) ensures that a Phase I archaeological survey of the Preferred Alternative, followed, if necessary, by Phase II and Phase III investigations will be conducted in a manner consistent with the Secretary of Interior's Standards and Guidelines for Identification (48 FR 44720-23) and the WVSHPO's October 1991 *Guidelines for Phase I Surveys, Phase II testing, Phase III Mitigation and Cultural Resource Reports*, as amended.

For archaeological resources that are NRHP eligible, avoidance is the preferred mitigation measure. However, mitigation options include:

- Minor alignment shifts.
- Data recovery excavation.

Because mitigation programs are specific to the type of resource involved, the programs vary widely in nature, complexity, and scope. For these reasons, WVDOT will closely coordinate with the WVDCH and other concerned parties in the development and implementation of such programs as warranted.

4.10 SURFACE WATER RESOURCES

4.10.1 METHODOLOGY

The water resources assessment followed the guidance of FHWA Technical Advisory T6640.8A (USDOT, 1987). The assessment identified major streams, rivers, and surface water bodies within the study area. The assessment focused on the quality of major watersheds, streams (intermittent and perennial), rivers, and lakes within the Preferred Alternative and the six Build Alternatives. In general, specific water quality data for the majority of medium-sized (excluding the mainstems of the Guyandotte and Tug Fork rivers) to small streams is lacking. With respect to streams, rivers, and lakes within the study area, the quality and diversity of aquatic habitat is closely associated with the nature and degree of subwatershed disturbance.

Secondary information relevant to streams was collected from WVDNR and Virginia's Department of Game and Inland Fisheries (VDGIF). This information included a listing of West Virginia's High Quality Streams (fifth edition of the published list of West Virginia High Quality Streams) and streams containing trout populations (WVDNR, 1989). Stream order, as discussed by Hynes (1970), was determined based on USGS topographic mapping.

Perennial and intermittent streams, lakes, and impoundments were identified on USGS 7.5 minute map series and digitized into a GIS database. The approximate location and extent of intermittent and perennial streams within the study area were field investigated in the summer of 1995. Identified streams were classified as perennial if they had flow during sustained periods of no precipitation and supported one or more species of aquatic life which require residence in flowing water for greater than six months.

The preliminary evaluation of surface water resources within the study area was based on qualitative field observation of the following factors:

- Watershed development and deforestation
- Acid drainage
- Physical alteration of surface water resources
- Watershed use (e.g. industrial, urban, rural, agricultural)
- Organic enrichment due to potential point and non-point pollution sources
- Presence of pesticides and other contaminant sources
- Local diversity and complexity of physical aquatic habitat
- Presence of algal scums and cyanobacteria
- Stream bank stability and erosion potential
- Turbidity and color
- Amount of aquatic vegetation

4.10.2 IMPACT ASSESSMENT

4.10.2.1 Watersheds

A total of three watersheds are located within the study area. The majority of the watersheds within the study area are disturbed by mining practices. For purposes of the study, the quality and potential degree of degradation of water resources were assumed to be related to the type and degree of disturbance within the watershed.

Table IV-13 details the number of hectares (acres) of potential watershed encroachment for the PA and each Build Alternative. Alternative 2B has the greatest total potential for watershed encroachment (4239 hectares [10,475 acres]); and Alternative 2D has the least potential (4062 hectares [10,037 acres]).

TABLE IV-13
WATERSHED ENCROACHMENT
COMPARISON BY BUILD ALTERNATIVE

Build Alternative		Guyandotte	Tug Fork	Upper New River	Total
2	Hectares	1428	2036	696	4160
	(Acres)	(3,529)	(5,031)	(1,720)	(10,279)
	% of Alternative	34%	49%	17%	100%
2A	Hectares	1295	2224	606	4125
	(Acres)	(3,200)	(5,496)	(1,497)	(10,193)
	% of Alternative	31%	54%	15%	100%
2B	Hectares	1428	2115	696	4239
	(Acres)	(3,529)	(5,226)	(1,720)	(10,475)
	% of Alternative	34%	50%	16%	100%
2C	Hectares	1295	2303	606	4204
	(Acres)	(3,200)	(5,691)	(1,497)	(10,388)
	% of Alternative	31%	55%	14%	100%
2D	Hectares	1428	2036	598	4062
	(Acres)	(3,529)	(5,031)	(1,478)	(10,037)
	% of Alternative	35%	50%	15%	100%
2E	Hectares	1428	2115	598	4141
	(Acres)	(3,529)	(5,226)	(1,478)	(10,232)
	% of Alternative	34%	51%	14%	100%
PA	Hectares	1428	2115	675	4,219
	(Acres)	(3,529)	(5,226)	(1,667)	(10,425)
	% of Alternative	34%	50%	16%	100

4.10.2.2 Surface Waters

Results of the identification of intermittent and perennial surface waters, high quality, and native and trout stocked waters for the PA and each Build Alternative are presented in Table IV-14. It is important to note that the number of occurrences (i.e. the number of stream segments crossed within a Build Alternative) can be on the same stream or stream segment because many streams meander throughout the limits of the Build Alternatives. Further, the number and lengths of potential stream involvements are very conservative because it is based on each corridor's limits. Thus, the number and lengths of potential surface water involvements presented in Table IV- 14 do not include bridging of resources and actual limits of cut/fill.

TABLE IV-14
SURFACE WATER RESOURCES WITHIN THE BUILD ALTERNATIVES

Build Alternative	Total Number Of Occurrences	Total		High Quality		Trout Stocked	
		Kilometers	(Miles)	Kilometers	(Miles)	Kilometers	(Miles)
2	107	37.24	(23.14)	20.32	(12.63)	5.48	(3.41)
2A	99	34.53	(21.46)	18.95	(11.78)	3.43	(2.13)
2B	108	41.51	(25.80)	18.25	(11.35)	5.48	(3.41)
2C	100	38.80	(24.11)	16.88	(10.49)	3.43	(2.13)
2D	104	35.90	(22.30)	18.97	(11.79)	5.48	(3.41)
2E	105	40.17	(24.96)	16.90	(10.51)	5.48	(3.41)
PA	108	40.99	(25.47)	17.33	(11.02)	5.48	(3.41)

Alternative 2A will encounter the least number of surface water occurrences (99), and Alternative 2B and the PA the greatest number of surface water involvements (108). In terms of total length of surface water involvement, Alternative 2A has the least amount, 34.53 kilometers (21.46 miles) and Alternative 2B has the greatest amount, 41.51 kilometers (25.80 miles).

None of the Build Alternatives will impact Outstanding State Resource Waters, National Resource Waters, Wild and Scenic Rivers, or rivers under study for designation to the National Wild and Scenic Rivers System. However, the Build Alternatives will impact headwater streams because the alignments predominantly traverse ridge tops. Headwater stream systems are typically trapezoidal in nature and are composed of high velocity material such as cobble and gravel intermixed with sand. First and second-order headwater stream systems which have not been previously impacted by surface disturbances (e.g. surface and deep bed mining, timber harvests) provide suitable habitat for a variety of non-game fish species and macroinvertebrates.

4.10.3 MITIGATION

The general approach to reducing surface water resource impacts within the PA is to avoid and minimize impacts to the greatest extent possible, then to compensate for any unavoidable impacts.

During preliminary design for the PA, impacts to streams will be avoided to the extent possible based on the following set of general guiding principles:

- Avoid native and stocked trout streams; bridge where practicable.
- Avoid longitudinal impacts to perennial and headwater streams.
- Bridge perennial streams, if practicable, to avoid culverts and/or relocations.
- Avoid transverse crossings of perennial streams in order to minimize the length of culverts and pipes.

Avoidance and minimization measures will be developed during the preliminary design stage. This will include identifying areas where surface water impacts can be avoided or reduced through adjustments to the location of the alignment (horizontal alignment) and the width of the construction limits (vertical alignment). Attempts will be made to adjust the horizontal and vertical alignments to avoid and/or minimize the number and length of relocations and enclosures. Where practicable, the vertical alignment will be modified to reduce the width of the construction limits in order to avoid stream encroachments. Avoidance and minimization measures also will include the balancing of cuts and fills to minimize waste in the project. This balancing will aid in minimizing impacts to stream valleys directly associated with the project in addition to waste and borrow sites.

Avoidance of all surface water resources is not possible considering the topography of the study area. Therefore, design and construction considerations will be used to minimize potential impacts. Mitigation measures specific to the right-of-way and the surface waters impacted will be developed. Mitigation measures will include:

- Implementation of an Erosion and Sediment Pollution Control Plan.
- Properly sized and engineered culverts for stream crossings to minimize impacts attributed to flood height and flood duration.
- Construction of detention treatment facilities.
- Culverted stream crossings which are properly sized and engineered to provide unobstructed, continuous flow for fishes and macroinvertebrates.
- When practicable, perpendicular stream crossings.
- Stream enhancement techniques such as creation of pool and riffle zones, planting stream-shading vegetation, constructing low-flow channels and pools, and strategic placement of boulders and channel deflectors within streams that are to be relocated.
- Enhancement of first- and second-order stream systems as a result of loss of intermittent and perennial headwater stream habitat.
- In areas where the potential for acid drainage is high, additional geotechnical investigations could be conducted to ascertain the potential for acid drainage as a result of construction cuts and the disposal of acidic overburden.

4.11 WETLANDS

4.11.1 METHODOLOGY

The wetland resource assessment followed the guidance of FHWA Technical Advisory T 6640.8A (USDOT, 1987). The assessment was composed of the following steps:

- Review of existing wetland data sources
- Field reconnaissance
- Wetland classification
- Qualitative functions and values assessment
- Build Alternative inventory

Prior to conducting field reconnaissance, the following secondary data sources were used to identify areas with a high probability of containing wetlands:

- Wetlands and ponds identified by the USFWS's National Wetlands Inventory (NWI).
- Areas of hydric soils identified in NRCS's County Soil Surveys.
- Impoundments and ponds as indicated on the USGS 7.5 minute map series.
- Stream valleys as indicated on the USGS 7.5 minute map series.
- Floodplains as indicated by the Federal Emergency Management Act on Flood Insurance Rate Maps.

The field reconnaissance was conducted in August and September of 1995 by environmental scientists trained in the use of the 1987 *U.S. Army Corps of Engineers Wetland Delineation Manual* (COE Manual). A wetland inventory data sheet was completed and photographs taken to document basic characteristics of each wetland. The approximate location and extent of each wetland was indicated on 1 centimeter = 240 meters (1 inch = 2,000 feet) scale project mapping. Field reviews were conducted of all high probability areas in order to determine the existence, size, and vegetative type of any wetlands present, and to evaluate wetland functions and quality. Wetlands were identified in the field in accordance with the criteria found in the 1987 COE Manual; however, a detailed delineation was not conducted. When construction limits for the Preferred Alternative are identified, the wetlands within the alignment will be delineated based on the routine on-site field method as specified in the 1987 COE Manual and located on detailed project mapping.

Wetland classification was based on the system developed for the USFWS (Cowardin et al., 1979). This hierarchical classification system was developed to describe wetlands and deep water habitats throughout the United States.

The wetland functions and values assessment was based on physical characteristics of the wetlands. Adjacent land use, landscape position, wetland size, and water source were used to determine if a wetland has the capacity to perform certain functions. Four wetland functions were evaluated for each wetland identified: aquatic habitat, wildlife habitat, flood flow alteration, and sediment/toxicant/nutrient removal. Each wetland was also evaluated to determine if it provided exceptional societal values.

A GIS was utilized to identify the location of each individual wetland within each of the Build Alternatives. The total number and area of wetlands within each Build Alternative was inventoried through the GIS.

4.11.2 IMPACT ASSESSMENT

A total of nine wetlands were identified within the Build Alternatives through field surveys and NWI maps (Table IV-15 and Exhibit IV-3). These wetlands are classified as palustrine emergent or palustrine scrub-shrub systems and are all located within the State of West Virginia. The field reconnaissance did not identify any wetlands within the Commonwealth of Virginia.

TABLE IV-15
WETLAND INVENTORY WITHIN THE BUILD ALTERNATIVES

Wetland Identification Number	Vegetation Class	Inventory	
		Hectares	Acres
KC-1	PEM	4.34	10.73
KC-2	PSS	0.05	0.12
KC-3	PSS	0.08	0.21
KC-3A	PEM	0.05	0.12
KC-4	PSS	1.33	3.30
KC-5	PSS	2.10	5.20
KC-6	PSS	0.14	0.34
KC-7	PEM	0.18	0.43
KC-8	PEM	0.25	0.62
	PEM Subtotal	4.82	11.90
	PSS Subtotal	3.70	9.17
	Inventory Total	8.52	21.07

Note: PEM=Palustrine Emergent Wetland; PSS=Palustrine Scrub-Shrub Wetland

A summary description of each identified wetland is provided below.

Wetland KC-1 - PEM
Wetland KC-1 is located on both sides of Mercer County 11/2, within a forested stream valley south of Matoaka. This wetland extends approximately 760 meters (2,500 feet) along a relatively flat and wide (30 to 60 meters [100 to 200 feet]) stream valley. Hydrology is supplied by a perennial stream and ponding due to the road crossing and beaver activity. Vegetation is predominantly herbaceous with a few scattered willows and standing dead timber. Minnows and several larger fish were observed in the stream which flows through the center of the wetland and frequently floods the wetland. Songbirds, hawks, and a great blue heron were observed near the wetland. Due to its large size, forested watershed, and consistent water supply, this wetland provides high levels of aquatic habitat, wildlife habitat, and flood flow alteration. This wetland has a high capacity for pollutant removal but few pollutant sources.

Wetland KC-2 - PSS
This small wetland is located near a coal community. It is ponded to inundated, and likely holds runoff from adjacent roadways. It is impacted by trash and small amounts of fill. This wetland provides limited functions due to its small size and hydrological isolation.

Wetland KC-3 - PSS
This small wetland was identified from NWI maps. It is located adjacent to a roadway and rural development near Bramwell, West Virginia. No functions were assigned to this wetland since it was not field verified.

Wetland KC-3A - PEM

This wetland is a small isolated wetland within a depression, located north of US Route 19. The dominant vegetation is herbaceous with shrubs and saplings scattered within the wetland boundaries. A high groundwater table provides most of the wetland hydrology. This wetland provides limited functions due to its small size and isolation.

Wetland KC-4 - PSS

This large wetland is located on the east of side of US 52, near the intersection with Mercer County 23. The wetland extends 450 meters (1,500 feet) along the floodplain valley of Brush Fork, along both sides of Mercer County 23. It is dominated by large shrubs and small trees, with scattered areas of herbaceous vegetation. Although it is located adjacent to two roadways, it provides high levels of wildlife habitat. Its location along the floodplain of Brush Fork allows it to provide flood storage. Frequent flooding and a constricted outlet (culvert) allows for a high potential for pollutant removal.

Wetland KC-5 - PSS

This wetland is located in a valley adjacent to a branch of the North Fork. The shrubs are primarily along the perimeter with herbaceous vegetation dominating the center. Small islands of shrubs are scattered throughout the herbaceous vegetation. The soil is saturated to inundated, with evidence that it remains wet most of the year. This wetland provides moderate levels of wildlife habitat, flood flow alteration, and pollutant removal.

Wetland KC-6 – PSS

Wetland KC-6 is located approximately 700 feet downslope from the James P. Bailey Lake. The wetland is situated on the broad floodplain of South Fork. The adjacent land use is residential with the majority of the watershed being forested. Little disturbance has occurred within the watershed. However, evidence of household sewage was observed in the adjacent stream. The dominant vegetation type within the wetland are shrubs, specifically black willow. Moderate ratings for aquatic and wildlife habitat are due to the small size, lack of permanent open water and pollutant sources. Moderate ratings apply for the potential for pollutant removal, as well. Low levels of floodflow capacity is provided by this wetland, due to its small size.

Wetland KC-7 – PEM

Wetland KC-7 is located approximately 150 meters (500 feet) east of James P. Bailey Lake. The wetland is surrounded by deciduous forest. However, no trees are located directly within the wetland. Wetland KC-7 is situated adjacent to an intermittent stream and extends around to the base of the adjacent hillside. The wetland lacks open water during most of the growing season. Due to its small size and lack of open water, this wetland was rated low for aquatic and wildlife habitat and floodflow alteration. The dense persistent vegetation and restricted outlet allows for a moderate potential for pollutant removal.

Wetland KC-8 – PEM

This wetland is a small isolated wetland within a depression, located north of US Route 19. Surface runoff provides most of the wetland hydrology. The dominant vegetation is herbaceous with shrubs and saplings sparsely scattered throughout the wetland. This wetland provides limited functions due to its small size, isolation, and lack of open water.

Potential wetland encroachments by Build Alternative is presented in Table IV-16. The Preferred Alternative will potentially impact the greatest area of wetlands (7.06 hectares [17.44 acres]) while Alternative 2C contains the least area of wetlands (1.41 hectares [3.51 acres]).

For each of the four functions evaluated (aquatic habitat, wildlife habitat, flood flow alteration, pollutant removal), the number of wetlands ranked as low, moderate, or high is presented in Table IV-17. All Build Alternatives contain the same number (3) of wetlands ranked high for particular functions. The PA contains the greatest number (10) of wetlands ranked moderate for particular functions and the greatest number of wetlands ranked low (11).

4.11.3 MITIGATION

Presidential Executive Order 11990 entitled, "Protection of Wetlands", establishes a National Policy to "avoid to the extent possible the long-term and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative".

Mitigation is considered a three-step procedure in the regulatory process. The first step is avoidance of wetland impacts to the extent practicable. The second step involves minimizing wetland impacts. The third step, if wetland impacts are unavoidable, is compensation.

Avoidance and minimization of impacts to wetlands can occur throughout the planning and design process. During final design, additional modification of the design could be included to further avoid or minimize impacts, such as reducing cut and fill slopes or extending bridges over wetlands. When final design is commenced, all appropriate and applicable permits will be obtained. For wetland encroachment permits, all of the technical information that has been generated for the National Environmental Policy Act (NEPA) studies will be incorporated into the permit package. This project was initiated prior to the institution of the Joint NEPA/404 Process. Field verification reviews will be conducted during development and review of the 404 permit application. Specific wetland mitigation requirements will be developed in conjunction with the 404 permitting process. This approach is consistent with adopted FHWA guidance on the coordination of NEPA studies and federal permit processing (Interagency Consensus on Integrating NEPA/404 for Transportation Projects, July 23, 1992).

Compensation for the loss of wetlands will include restoration, enhancement, or replacement of wetlands. Restoration of wetlands degraded by local land practices is one form of compensation.

Replacement as a form of compensation for wetland impacts requires construction of a new wetland. Replacement may occur either within the same watershed as the impacted wetland or within a different watershed. The replacement wetland may provide a wetland of the same vegetation class as the impacted wetland (in-kind replacement) or a wetland of a different vegetation (out-of-kind replacement). The functions and values of impacted wetlands must also be replaced.

4.12 FLOODPLAINS AND FLOODWAYS

4.12.1 METHODOLOGY

Officially designated floodplains and floodways were identified based on mapping provided by the National Flood Insurance Program. This program was established by FEMA and is administered and enforced through local governments. FEMA produces Flood Boundary and Floodway Maps (FBFMs) which delineate the floodplains and floodways based on detailed hydraulic studies. Flood Insurance Rate Maps produced by FEMA are based on the same hydraulic studies as FBFMs, but provide flood rate zones and estimated flood elevations.

TABLE IV-16
POTENTIAL WETLAND ENCROACHMENT BY BUILD ALTERNATIVE

Wetland Id No.	Wetland Class	Alternative 2		Alternative 2a		Alternative 2b		Alternative 2c		Alternative 2D		Alternative 2e		PA	
		Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)
KC-1	PEM	4.34	(10.73)	--	--	4.34	(10.73)	--	--	4.34	(10.73)	4.34	(10.73)	4.34	(10.73)
KC-2	PSS	0.05	(0.12)	0.05	(0.12)	--	--	--	--	0.05	(0.12)	--	--	--	--
KC-3	PSS	--	--	0.08	(0.21)	--	--	0.08	(0.21)	--	--	--	--	--	--
KC-3A	PEM	--	--	--	--	--	--	--	--	--	--	--	--	0.05	(0.12)
KC-4	PSS	--	--	1.33	(3.30)	--	--	1.33	(3.30)	--	--	--	--	--	--
KC-5	PSS	2.10	(5.20)	--	--	2.10	(5.20)	--	--	2.10	(5.20)	2.10	(5.20)	2.10	(5.20)
KC-6	PSS													0.14	(0.34)
KC-7	PEM													0.18	(0.43)
KC-8	PEM													0.25	(0.62)
ALTERNATIVE TOTALS		6.49	(16.05)	1.46	(3.63)	6.44	(15.93)	1.41	(3.51)	6.49	(16.05)	6.43	(15.94)	7.06	(17.44)

Note: PEM = Palustrine Emergent Wetland; PSS = Palustrine Scrub-Shrub Wetland

TABLE IV-17
WETLAND FUNCTIONAL SUMMARY

Build Alternative	Number of Wetlands														
	Aquatic Habitat			Wildlife Habitat			Flood Flow Alteration			Pollutant Removal			Total*		
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
2	2	0	1	1	1	1	1	1	1	1	2	0	5	4	3
2A	1	1	0	1	0	1	1	0	1	1	0	1	4	1	3
2B	1	0	1	0	1	1	0	1	1	0	2	0	1	4	3
2C	0	1	0	0	0	1	0	0	1	0	0	1	0	1	3
2D	2	0	1	1	1	1	1	1	1	1	2	0	5	4	3
2E	1	0	1	0	1	1	0	1	1	0	2	0	1	4	3
PA	4	1	1	3	2	1	4	1	1	0	6	0	11	10	3

Flood Insurance Rate Maps and FBFMs for Mingo, Logan, McDowell, Wyoming, and Mercer counties, West Virginia and Tazewell County, Virginia were obtained to determine the limits of the 100-year floodplains and regulatory floodways within the Build Alternatives. The location of FEMA floodplains and floodways were entered into a GIS. An inventory of the floodplains and floodways within the Build Alternatives was produced.

The extent of floodplains and floodways within the 300 meter (984 foot) wide Build Alternatives was determined for comparative purposes. These figures represent the potential impacts to floodplains and floodways by the King Coal Highway.

4.12.2 IMPACT ASSESSMENT

4.12.2.1 Floodplains and Floodways

Floodway and floodplains within the Build Alternatives range from a high of 36 hectares (88 acres) for Alternative 2 to a low of 27 hectares (66 acres) for Alternative 2C (Table IV-18). Comparison of potential impacts to floodways and floodplains indicates that all Build Alternatives would have similar impacts. This is the result of selecting Build Alternative corridors that traverse hillsides and ridge tops while avoiding valleys to the extent practicable.

As previously stated, coordination with the appropriate state/federal/local agencies and a detailed Location Hydraulic Study will be completed in accordance with 23 CFR 650 for the Preferred Alternative during the preliminary and final design stages of this project.

The Location Hydraulic Study will provide detailed hydraulic analyses of the effects of floodplain and floodway encroachments on flood elevations. These analyses will determine the proper design for pipes, culverts, and bridges to insure flood elevations will have "no net effect" due to highway construction.

TABLE IV-18
FLOODPLAIN AND FLOODWAY INVENTORY

			100-Year Floodplain						Regulatory Floodway						Total Encroachment Within Watershed	
			Longitudinal		Transverse		Complex		Longitudinal		Transverse		Complex			
Alternative	Watershed	Watercourse	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)
2	Tug Fork	Lick Branch			0.07	0.18										
		Pigeon Creek	1.14	2.80					1.87	4.62						
		Stonecoat Branch			2.34	5.79										
		Tug Fork					6.77	16.73	2.55	6.30					14.74	36.42
	Upper New	Bluestone River			0.08	0.21	0.86	2.13			0.02	0.05	1.46	3.60		
		East River			1.28	3.17										
		Middle Fork			1.54	3.81										
		Middle Fork Tributary			0.19	0.47										
		Sandlick Creek	2.39	5.90			10.26	25.35								
		South Fork			2.81	6.95									20.89	51.64
Alternative 2 – Total Encroachments			3.53	8.70	8.31	20.58	17.89	44.21	4.42	10.92	0.02	0.05	1.46	3.60	35.63	88.06
2A	Tug Fork	Lick Branch			0.07	0.18										
		Pigeon Creek	1.14	2.80					1.87	4.62						
		Stonecoat Branch			2.34	5.79										
		Tug Fork					6.77	16.73	2.55	6.30					14.74	36.42
	Upper New	Beaver Pond Creek			1.00	2.48										
		Bluestone River			0.66	1.64					0.95	2.36				
		Brush Fork			0.53	1.30	1.28	3.15			0.32	0.80	0.66	1.63		
		Brush Fork Tributary			2.52	6.23										
		Lorton Lick Creek			0.12	0.30										
		Simmons Creek	9.85	24.33											17.89	44.22
Alternative 2A – Total Encroachments			10.99	27.13	7.24	17.92	8.05	19.88	4.42	10.92	1.27	3.16	0.66	1.63	32.63	80.64
2B	Tug Fork	Lick Branch			0.07	0.18										

TABLE IV-18
FLOODPLAIN AND FLOODWAY INVENTORY

			100-Year Floodplain						Regulatory Floodway						Total Encroachment Within Watershed	
			Longitudinal		Transverse		Complex		Longitudinal		Transverse		Complex			
Alternative	Watershed	Watercourse	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)
		Pigeon Creek	2.77	6.84					3.53	8.73						
		Stonecoat Branch			2.34	5.79										
		Tug Fork													8.71	21.54
	Upper New	Bluestone River			0.08	0.21	0.86	2.13			0.02	0.05	1.46	3.60		
		East River			1.28	3.17										
		Middle Fork			1.54	3.81										
		Middle Fork Tributary			0.19	0.47										
		Sandlick Creek	2.39	5.90			10.26	25.35								
		South Fork			2.81	6.95									20.89	51.64
Alternative 2B – Total Encroachments			5.16	12.74	8.31	20.58	11.12	27.48	3.53	8.73	0.02	0.05	1.46	3.60	29.60	73.18
2C	Tug Fork	Lick Branch			0.07	0.18										
		Pigeon Creek	2.77	6.84					3.53	8.73						
		Stonecoat Branch			2.34	5.79									8.71	21.54
	Upper New	Beaver Pond Creek			1.00	2.48										
		Bluestone River			0.66	1.64					0.95	2.36				
		Brush Fork			0.53	1.30	1.28	3.15			0.32	0.80	0.66	1.63		
		Brush Fork Tributary			2.52	6.23										
		Lorton Lick Creek			0.12	0.30										
		Simmons Creek	9.85	24.33											17.89	44.22
Alternative 2C – Total Encroachments			12.62	31.17	7.24	17.92	1.28	3.15	3.53	8.73	1.27	3.16	0.66	1.63	26.60	65.76
2D	Tug Fork	Lick Branch			0.07	0.18										
		Pigeon Creek	1.14	2.80					1.87	4.62						
		Stonecoat Branch			2.34	5.79										

TABLE IV-18
FLOODPLAIN AND FLOODWAY INVENTORY

			100-Year Floodplain						Regulatory Floodway						Total Encroachment Within Watershed	
			Longitudinal		Transverse		Complex		Longitudinal		Transverse		Complex			
Alternative	Watershed	Watercourse	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)
		Tug Fork					6.77	16.73	2.55	6.30					14.74	36.42
	Upper New	Bluestone River			0.08	0.21	0.86	2.13	0.02	0.05			1.46	3.60		
		Middle Fork			1.54	3.81										
		Middle Fork Tributary			0.19	0.47										
		Sandlick Creek	2.39	5.90			10.26	25.35								
		South Fork			2.81	6.95									19.61	48.47
Alternative 2D – Total Encroachments			3.53	8.70	7.03	17.41	17.89	44.21	4.44	10.97	0.00	0.00	1.46	3.60	34.35	84.89
2E	Tug Fork	Lick Branch			0.07	0.18										
		Pigeon Creek	2.77	6.84					3.53	8.73						
		Stonecoat Branch			2.34	5.79									8.71	21.54
	Upper New	Bluestone River			0.08	0.21	0.86	2.13	0.02	0.05			1.46	3.60		
		Middle Fork			1.54	3.81										
		Middle Fork Tributary			0.19	0.47										
		Sandlick Creek	2.39	5.90			10.26	25.35								
		South Fork			2.81	6.95									19.61	48.47
Alternative 2E – Total Encroachments			5.16	12.74	7.03	17.41	11.12	27.48	3.55	8.78	0.00	0.00	1.46	3.60	28.32	70.01

PA	Tug Fork	Lick Branch			0.07	0.18										
		Pigeon Creek	2.77	6.84					3.53	8.73						
		Stonecoat Branch			2.34	5.79									8.71	21.54
	Upper New	Bluestone River			0.08	0.21	0.86	2.13	0.02	0.05			1.46	3.60		
		East River			1.36	3.35										

TABLE IV-18
FLOODPLAIN AND FLOODWAY INVENTORY

			100-Year Floodplain						Regulatory Floodway						Total Encroachment Within Watershed	
			Longitudinal		Transverse		Complex		Longitudinal		Transverse		Complex			
Alternative	Watershed	Watercourse	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)	ha	(ac)
		Middle Fork			1.35	3.34										
		Sandlick Creek	2.39	5.90			10.26	25.35								
		South Fork			2.35	5.82									20.13	49.75
	PA – Total Encroachments		2.39	5.9	7.55	18.69	11.12	27.48	3.56	8.79			1.46	3.60	28.84	71.29

In addition, the Location Hydraulic Study will address flooding risks; impacts to natural and beneficial floodplain values; support of probable incompatible floodplain development; specific measures to minimize floodplain impacts; and measures to restore natural and beneficial floodplain values.

Floodplain regulations require the use of National Flood Insurance Program (NFIP) maps to identify the limits of the base (100 year) floodplain. The NFIP was instituted by FEMA and is administered and enforced by local communities within the project area. Under the authority of NFIP, various communities have established permit requirements for development within the base floodplain zone. A community's participation and status in the NFIP is based on one of two programs: the Regular Program and the Emergency Program.

Communities in the NFIP's Regular Program generally have quantitative flood hydraulic studies on each floodway. The floodway, as previously defined, is the channel and portions of the adjacent floodplain of a stream that must be kept free of encroachment so the 100-year flood can be carried without raising the water surface elevation level more than one foot. No increase in the 100-year flood elevation is permitted within the Regulatory Floodway and a one foot increase is permitted within the Regulatory Floodplain in accordance with FEMA § 60.3(d)(3). Communities that adhere to NFIP's Emergency Program generally do not possess quantitative flood hydraulic data for the floodway. In these cases, the NFIP map is a Flood Hazard Boundary Map (FHBM) that details approximate base floodplain boundaries.

Although precise cut/fill limits are not known at this time for the PA, there will be no significant impact to the floodplain or floodway as defined in the preceding paragraph. WVDOH is committed to developing construction projects which have "no net affect" on the 100-year floodplain (i.e., no increase in the Regulatory Floodway and less than a one-foot increase in the 100-year floodplain elevation). Likewise, no waste (i.e., excess excavation) will be placed in a 100-year floodplain without conducting hydraulic modeling to assure that there will be a "no net affect" determination and no fill material will be placed in a regulated floodway.

4.12.2.2 Flood Control Projects

The King Coal Highway will not conflict with the existing flood control impoundment, R.D. Bailey Lake, nor with the existing floodwalls within Williamson, West Virginia. The Build Alternatives closest to the floodwalls in Williamson, West Virginia (2, 2A, and 2D) are located approximately 1220 meters (4,000 feet) to the north along US 52.

The Preferred Alternative will traverse the upper reaches of the Brush Creek watershed, which includes a NRCS watershed protection and flood prevention project. Potential impacts from increased sediment runoff as a result of construction and operation of the Preferred Alternative will be addressed during detailed design which will also include appropriate geotechnical investigations. During the design and construction phase of the project, no fill material will be placed within the flood pools of watershed dams, and appropriate sediment and erosion control practices will be employed. Structures (e.g., dams) that may be sensitive to blasting will be identified and measures will be taken to protect their structural integrity. Also, measures to minimize impacts to streams and sensitive flood control resources will be evaluated and employed where necessary. Examples of such measures include: the utilization of best management practices for erosion and sedimentation control during construction and operation of the facility; open box culverts; and bridging.

4.12.3 MITIGATION

The following mitigation measures will be considered in order to avoid and minimize impacts to floodplains and floodways:

- Avoid encroachment into regulated floodways.
- Avoid or minimize roadway construction within floodplains.
- Use larger or multiple culverts to reduce floodwater elevations.
- Lengthen bridges to avoid placing abutments within floodplains.

4.13 GEOLOGY, MINERAL RESOURCES, SOILS, AND GROUNDWATER

4.13.1 METHODOLOGY

An assessment of the geologic features, mineral resources, soils, and groundwater hydrology within the study area was conducted using existing resource maps and other secondary sources of information. Information regarding these natural resources was obtained from the following:

- Natural Resource Conservation Service (NRCS)
- Oil and Gas Information Service (OGIS)
- United States Environmental Protection Agency (USEPA)
- United States Geological Survey (USGS)
- Virginia Department of Environmental Quality (VADEQ)
- Virginia Department of Health (VADH)
- Virginia Department of Mineral Resources (VDMR)
- West Virginia Coal Association (WVCA)
- West Virginia Department of Environmental Protection (WVDEP)
- West Virginia Department of Health and Human Resources (WVDHHR)
- West Virginia Department of Natural Resources (WVDNR)
- West Virginia Geological and Economic Survey (WVGES)

4.13.1.1 Mineral Resources

Information and maps regarding the mineral resources of the study area were obtained from the WVGES. The locations of active and inactive surface mine and subsurface mine portals as of 1993 were obtained from the WVGES. Areas of surface (strip) mining were identified by blue line areas on USGS 7.5 minute map series and by aerial photography flown in March 1995. The mine boundaries were entered into a GIS and placed on project mapping for assessment. Maps illustrating the location of known oil and gas exploration holes and wells were obtained from the OGIS. All exploration holes and wells found within the study area were entered into the GIS.

4.13.1.2 Soils

Soil surveys of Wyoming and Mercer counties, West Virginia were obtained from the NRCS. A soil survey has not been developed for Mingo and Logan counties, West Virginia. Additionally, such soil surveys have not been published for Tazewell County, Virginia or McDowell County, West

Virginia. Because of this, general soil maps of West Virginia and Virginia were obtained from NRCS offices. The general soil maps illustrate the major soil associations found within counties where no specific soil surveys have been completed. County soil surveys, general soil maps of each state, and interviews with NRCS conservationists, were used to identify soil types with potential erosion and landscape stability hazards within the study area.

4.13.1.3 Groundwater

Maps depicting the groundwater hydrology of Mingo, Logan, McDowell, Wyoming, and Mercer counties, West Virginia were obtained from the WVDEP. These maps illustrate geological units, groundwater availability, and groundwater quality within the study area. A groundwater hydrology report has not been developed for Tazewell County, Virginia.

Well information from the WVDHHR and the USEPA's STORET Groundwater Database, which includes the USGS Groundwater Information Service data, was used to determine the location of known wells within each Build Alternative.

4.13.2 IMPACT ASSESSMENT

4.13.2.1 Mineral Resources

Mining

Coal mining is the principal mining activity in the study area. Coal resources provide approximately 85% of mineral production in West Virginia as of 1992 (WVGES, 1994). Generally, the topographic, geologic, structure, thickness, and quality of the coal seams dictate the mining techniques used to extract the coal. Within the Build Alternatives numerous coal seams have been mined by surface methods. No known subsurface mines have been identified with the Build Alternatives. Table IV-19 identifies the coal seams contained in each geologic unit found within the Build Alternatives.

TABLE IV-19
GEOLOGIC UNITS AND ASSOCIATED COAL SEAMS

Geologic Unit	Coal Seams	Build Alternatives
Allegheny Formation	Freeport, Kittanning, and Clarion	All
Kanawha Formation	Stockton (Mercer), Coalburg, Winifrede, Cedar Grove, Chilton, Williamson, Alma, Peerless, Campbell Creek, Powellton, Eagle, Gilbert, and Douglas	All
New River Formation	Iaeger, Sewell, Fire Creek, Welch, Raleigh, Beckley, and Pocahontas numbers 8 and 9	All
Pocahontas Formation	Pocahontas numbers 1 through 7	All

Sources: Alvord and Trent, 1962 and Cardwell et al., 1968.

Surface Mining

Table IV-20 presents the status and acreage of the surface mined areas within the Build Alternatives. With respect to surface mined areas, Alternative 2C will encounter the smallest area (690 hectares [1,705 acres]) and Alternatives 2 and 2D will encounter the greatest area (736 hectares [1,818 acres]).

TABLE IV-20
SURFACE MINING INVOLVEMENT BY BUILD ALTERNATIVE

Build Alternative	Active		Inactive		Reclaimed		Total	
	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)
2	24	(59)	421	(1,041)	290	(718)	736	(1,818)
2A	24	(59)	432	(1,068)	265	(656)	721	(1,783)
2B	24	(59)	390	(964)	290	(718)	704	(1,740)
2C	24	(59)	401	(991)	265	(656)	690	(1,705)
2D	24	(59)	421	(1,041)	290	(718)	736	(1,818)
2E	24	(59)	390	(964)	290	(718)	704	(1,740)
PA	24	(59)	390	(964)	290	(718)	704	(1,740)

Note: Areas presented in this table were obtained from USGS topographic maps at 1:24,000 (1 inch = 2,000 feet) scale. Areas presented in Tables IV-1, IV-25, and IV-26 reflect USGS land use and land cover mapping at 1:25,000 (1 inch = 4 miles) scale.

TABLE IV-21
GEOLOGIC FORMATIONS AND ASSOCIATED COAL SEAMS

Geologic Formation	Associated Coal Seams	Acid Potential	Approx. Depth Range meters	Approx. Depth Range (feet)	Approx. Thickness Range meters	Approx. Thickness Range (feet)	Build Alternatives
Allegheny	Freeport	High	0 - 625	(0 - 2,050)	0.3 - 1.5	(1 - 5)	ALL
	Kittanning	High	0 - 686	(0 - 2,250)	0 - 2.4	(0 - 8)	
	Clarion	High	0 - 716	(0 - 2,350)	0.3 - 1.2	(1 - 4)	
New River	Iaeger	Low	0 - 457	(0 - 1,500)	0.6 - 1.5	(2 - 5)	ALL
	Sewell	Low/Moderate	0 - 366	(0 - 1,200)	0.9 - 3.0	(3 - 10)	
	Welch	Low	0 - 366	(0 - 1,200)	0 - 1.5	(0 - 5)	
	Little Raleigh	High	0 - 366	(0 - 1,200)	0 - 0.6	(0 - 2)	
	Beckley	Low	0 - 366	(0 - 1,200)	0.9 - 3.0	(3 - 10)	
	Fire Creek	Low	0 - 366	(0 - 1,200)	0 - 1.5	(0 - 5)	
	Pocahontas # 8	Low/Moderate	0 - 366	(0 - 1,200)	0 - 0.6	(0 - 2)	
	Pocahontas # 9	Low	0 - 366	(0 - 1,200)	0.6 - 1.5	(2 - 5)	
Pocahontas	Pocahontas # 1	Low	0 - 457	(0 - 1,500)	0 - 1.5	(0 - 5)	ALL
	Pocahontas # 2	Low	0 - 457	(0 - 1,500)	0 - 0.6	(0 - 2)	
	Pocahontas # 3	Low	0 - 457	(0 - 1,500)	1.5 - 4.6	(5 - 15)	
	Pocahontas # 4	Low	0 - 457	(0 - 1,500)	0 - 2.4	(0 - 8)	
	Pocahontas # 5	Low	0 - 457	(0 - 1,500)	0 - 1.5	(0 - 5)	
	Pocahontas # 6	Low/Moderate	0 - 366	(0 - 1,200)	0 - 1.5	(0 - 5)	
	Pocahontas # 7	Low/Moderate	0 - 366	(0 - 1,200)	0 - 0.9	(0 - 3)	
Kanawha	Stockton (Mercer)	None	0 - 457	(0 - 1,500)	0.9 - 3.0	(3 - 10)	ALL
	Coalburg	None	0 - 457	(0 - 1,500)	0.9 - 3.0	(3 - 10)	
	Winifrede	None	0 - 457	(0 - 1,500)	0.3 - 3.0	(1 - 10)	
	Chilton	None	0 - 457	(0 - 1,500)	0.9 - 2.4	(3 - 8)	
	Williamson	Low	0 - 457	(0 - 1,500)	0.3 - 2.4	(1 - 8)	
	Cedar Grove	Low/Moderate	0 - 457	(0 - 1,500)	0.9 - 1.8	(3 - 6)	
	Alma	Low	0 - 457	(0 - 1,500)	0.3 - 2.4	(1 - 8)	
	Peerless	Low	0 - 457	(0 - 1,500)	0.6 - 1.2	(2 - 4)	
	Campbell Creek	Low	0 - 457	(0 - 1,500)	0.6 - 3.0	(2 - 10)	
	Powellton	Low	0 - 457	(0 - 1,500)	0 - 1.2	(0 - 4)	
	Eagle	Low	0 - 457	(0 - 1,500)	0.3 - 1.8	(1 - 6)	
	Gilbert	None	0 - 366	(0 - 1,200)	0.3 - 1.2	(1 - 4)	
	Douglas	None	0 - 305	(0 - 1,000)	0 - 1.2	(0 - 4)	
Marcellus	N/A	High (Dark Shales)	0 - 3322	(0 - 10,900)	30 - 91	(100 - 300)	ALL

Sources: Alvord et al., 1962; Cardwell et al., 1968; Hennen, 1915a; Hennen, 1915b; Lotz, 1970; and Skousen, 1996.

Acid Drainage

Due to the low acid producing potential of the Kanawha, New River, and Pocahontas Formations that make up the majority of the study area, the amount of acid and metals released from exposed rocks during highway construction will be relatively low (Table IV-21). Additionally, if the surrounding rock and soil materials contain sufficient buffering capacity, acid products will be largely neutralized locally (Skousen and Ziemkiewicz, 1995).

Acid producing coal seams and dark shales occur within the study area. The depth at which coal seams are encountered varies from surface outcrops to 716 meters (2,350 feet) or more below the surface (Hennen, 1915a; Hennen, 1915b; and Lotz, 1970) (Table IV-21).

Additionally, coal seams vary in thickness from a few centimeters (inches) to several meters (feet). Their thickness can change abruptly over a short distance (Hennen, 1915a; Hennen, 1915b; and Lotz, 1970). Because individual coal seams can extend over many square kilometers (miles) each of the Build Alternatives contains several coal seams (Hennen, 1915a; Hennen, 1915b; and Lotz, 1970).

Natural Gas

The Build Alternatives are located within the region of the Central Appalachian Basin, which has the highest potential for methane production. Table IV-22 presents the natural gas wells found within the Build Alternatives.

TABLE IV-22
DEEP NATURAL GAS RELATED WELLS

Build Alternative	Dry Hole	Gas	Plugged	Total
2	1	25	4	30
2A	1	22	4	27
2B	0	25	4	29
2C	0	22	4	26
2D	1	23	4	28
2E	0	23	4	27
PA	0	23	4	27

Source: OGIS, 1995.

Saline Water Intrusion

The typical grading and excavation of highway projects will not extend to the great depths necessary to expose saline aquifers, and no deep wells will be drilled during highway construction. Therefore, saline water intrusion into fresh water aquifers will not result from the King Coal Highway. However, numerous deep producing and abandoned exploration wells are found within the Build Alternatives. Some of these existing wells could currently be functioning as sources of saline water intrusion. Such deep wells will be properly capped and sealed to avoid possible contamination of groundwater from highway runoff. This could possibly decrease the amount of current saline water intrusion in some areas.

4.13.2.2 Soils

Erosion Hazard

The erosion hazard for soils identified within the study area ranges from slight to severe, depending on soil type, slope, and texture. Table IV-23 identifies the soil associations found within the Build Alternatives and their erosion hazards.

Landscape Stability Hazard

The soils throughout most of the study area are basically stable due to the high percentage of sandstone parent material (USDA, 1995). Table IV-24 identifies the landscape stability hazard for the soils within the Build Alternatives.

TABLE IV-23
SOIL ASSOCIATIONS AND EROSION HAZARD RATINGS

Soil Association	Erosion Hazard	Build Alternative
Clymer-Dekalb-Jefferson	Slight to Severe	All
Berks-Pineville	Moderate to Severe	All
Cedarcreek-Dekalb-Kaymine	Moderate to Severe	All
Clymer-Gilpin-Udorthents	Moderate to Severe	All
Calvin high base substratum-Berks-Gilpin	Moderate to Severe	All
Murrill-Fredrick-Caneyville	Slight to Severe	All
Dekalb-Berks-Weikert	Slight to Severe	2A and 2C
Calvin-Berks	Slight to Severe	2A and 2C
Fredrick-Elliber	Slight to Severe	2A and 2C

Sources: USDA, 1988, 1984; and NRCS established soil descriptions.

TABLE IV-24
SOIL ASSOCIATIONS AND LANDSCAPE STABILITY HAZARD RATINGS

Soil Association	Landscape Stability Hazard	Build Alternatives
Clymer-Dekalb-Jefferson	Slight to Moderate	All
Berks-Pineville	Slight to Moderate	All
Cedarcreek-Dekalb-Kaymine	Slight to Moderate	All
Clymer-Gilpin-Udorthents	Slight to Moderate	All
Calvin high base substratum-Berks-Gilpin	Slight to Moderate	All
Murrill-Fredrick-Caneyville	Slight	All
Dekalb-Berks-Weikert	Moderate	2A and 2C
Calvin-Berks	Moderate	2A and 2C
Fredrick-Elliber	Slight	2A and 2C

Sources: USDA, 1993, 1988, 1984, and NRCS established soil descriptions.

4.13.2.3 Groundwater

The potential impact to groundwater quality will involve both surface waters (which receive their base flows from groundwater) and wells used for potable water. The greatest potential impact to existing drinking water wells is in the populated areas along existing transportation corridors. Only one groundwater well is located within the Build Alternatives. It is located in Mingo County and serves Creekwood Apartments in Newtown. This well is within all Build Alternatives.

In areas where the Build Alternatives do not follow existing transportation corridors, the major concern for groundwater quality will be the project's potential impact to surface streams that receive their base flow from groundwater sources.

The potential impact on groundwater resources in the study area can be related to geologic formations containing aquifers. Fractured sandstone is one of the best sources of groundwater. Construction activities that may create additional fractures or blockages in these water-bearing strata may alter the quantity of groundwater. Local wells and streams could experience a temporary or permanent loss of groundwater quantity. However, sometimes fracturing caused by construction could increase the water capacity of a particular geologic stratum.

Groundwater quality may also be affected by the King Coal Highway. Wells in sandstone could possibly experience reduced groundwater quality due to pollutants and sediment in surface waters that infiltrate groundwater systems. Additionally, water-born pollutants generated by the operation and maintenance of the highway could possibly infiltrate into the groundwater system.

There will be minimal impact to public water systems from the King Coal Highway due to the required Well Head Protection buffer zones. Long-term adverse impacts to groundwater wells used by public water systems are not anticipated. However, short-term impacts such as increased turbidity may occur.

Karst Aquifers

Karst topography is rather limited within the study area. It occurs in the relatively narrow bands of the Greenbrier Group near Bluefield, West Virginia and in Tazewell County, Virginia. Groundwater in karst terrain is more susceptible to contamination from highway runoff and other sources, because surface water may pass directly into subsurface aquifers with little or no filtration. Since karst groundwater typically flows through large fractures and solution cavities, it can transport contaminants rapidly and for great distances.

Construction of highways through karst areas may also have an effect on the quantity of groundwater flowing through a karst aquifer, if drastic changes are made to the associated surface and subsurface flow systems. Such changes can result from the diversion of surface drainage during grading and excavation, or from blasting of bedrock. Predicting whether blasting will have any effect on the quantity of water flowing through a karst aquifer is dependent on the location of the subsurface flow system. If a highway cut is made above the conduit flow supplying the system, reduction of flow most likely will not result. If a highway cut intercepts a conduit flow, changes in groundwater basin boundaries and supplies to private water wells with perennial flow may be altered. Sinkholes may develop due to the loss of support resulting from the reduction of hydrostatic pressure of groundwater (Davies et al., 1984).

4.13.3 MITIGATION

4.13.3.1 Mines

Mitigation measures taken during construction through active or reclaimed/non-reclaimed strip mined areas will include the proper treatment or removal of waste deposits and or any acidic materials that would contribute to the formation of acid drainage. During final design, drainage control devices or methods will be determined on a site-specific basis. During construction, surface treatment will be implemented to minimize erosion potential and densification of the subgrade. In addition, revegetation and proper soil cover procedures will be used to minimize or eliminate the formation of acid drainage.

No known subsurface mines have been identified within the Build Alternatives. However, should previously unidentified subsurface mines be found during construction, mitigation measures will be based on site-specific circumstances. Depending on the circumstances, measures could include bridging, sealing, subsurface reinforcement, backfilling, or capping the deep mine area. Areas where the coal seams are relatively close to the surface could require saturation grouting with a cement and fly ash mix. Where open cavities are present, underpinning the roof overburden by grout columns could be required.

Measures to avoid exposure of coal seams will be considered in final design. The exact depth to the coal seam will be determined through use of exploration borings into the underlying rock stratum. Adjustments to the finished grade of the King Coal Highway to an elevation above the coal seam could then be made. When avoidance is not possible, exploration borings will be used to determine the exact depth, thickness, and slope of the coal seam in relation to the local groundwater table. If the groundwater table is beneath the coal seam, construction activities and subsequent exposure of the coal seam will not likely produce acid drainage. If the coal seam is located below the local groundwater table and drainage is visible from the seam, a chemical analysis of the groundwater could be performed to determine whether the groundwater exhibits the typical chemical characteristics of acid drainage. If found to contain acid drainage, proper diversion and treatment of the acid drainage will be executed so as not to degrade the quality of surface waters down gradient of the proposed highway cut.

4.13.3.2 Acid Drainage

Mitigation measures for acid drainage will be developed in coordination with WVDEP and USFWS during the final design phase of the project. Detailed information obtained from geotechnical borings will be used to predict the location and the severity of acid drainage. In areas where acid producing materials are identified, contractors will be required to develop an Acid Producing Materials Handling Plan (Plan) as part of the contract plans. The Plan will be reviewed and approved by WVDOH prior to construction within areas containing acid producing materials. The Plan will address measures to avoid and minimize the production of acidic drainage during construction. These measures could include:

- The incorporation of limestone into the roadway subbase in an amount necessary to buffer the acid producing capacity. The amount and type of limestone to be used will be determined following acid-base accounting investigations.
- Maintenance of a construction schedule that will allow for the compaction and covering of any acid producing material within 48 hours of exposure.
- In acid producing areas that may be exposed by deep cuts, benching and revegetation of benches will be employed where practicable.
- Should acid drainage occur following construction, necessary and practicable mitigation measures will be developed.

All excess excavation which results from acid producing materials will be disposed of in accordance with the approved Plan. The location of the disposal will be coordinated with WVDEP and USFWS, and approved by WVDOT.

4.13.3.3 Saline Water Intrusion

No deep wells will be installed during construction of the King Coal Highway. However, if previously unidentified deep wells are encountered during construction, they will be properly sealed to avoid potential contamination of groundwater resources.

4.13.3.4 Soils And Groundwater

During the final design, an Erosion and Sediment Pollution Control Plan (ESPCP) will be prepared according to all federal, state, and local regulations. The goal of the ESPCP will be to prevent accelerated erosion of the disturbed land and to reestablish the vegetation removed during construction. The plan could also contain post-construction methods to maintain and reestablish wetland and floodplain vegetative buffers that will reduce sediment erosion, siltation, and the delivery of pollutants downstream. Examples of these methods are as follows:

- The installation of stormwater management facilities could control increased stormwater runoff. A secondary benefit will be the biological treatment of point and nonpoint source pollutant runoff from the developed surfaces.
- A pre-construction analysis of excess excavated material could be performed to estimate the amounts of those materials that will need to be contained. Appropriate disposal sites will be identified and designed so as not to contaminate surface and groundwater. If practicable, the disposal site should be located beyond the limits of the floodplains. Erosion and sediment control devices could be implemented at each disposal site.
- Sedimentation basins could be used as a temporary sediment control device that will retain sediment laden runoff water for a duration long enough to remove the suspended solids before releasing the water to a natural watercourse.
- Other ESPCP facilities could include interceptor and diversion ditches, with appropriate lining material, fabric filter fence, straw bales, seeding and mulching.
- Proper engineering design based on site-specific circumstances will be used to avoid vertical cuts where landscape stability hazards are of concern. Measures could include terraced cuts, sufficiently sloped cuts, retaining walls, revegetation, and diversion ditches.

In addition, the final design for the Preferred Alternative will comply with the requirements of the Well Head Protection procedures for public wells established by West Virginia and Virginia.

4.14 VEGETATION AND WILDLIFE

4.14.1 METHODOLOGY

A habitat evaluation was performed to generally assess the potential wildlife habitat as well as the projected impact within each of the six Build Alternatives. The USFWS's Habitat Evaluation Procedure (HEP) (1980) in conjunction with the USFWS's Habitat Suitability Index (HSI) (1987) was used to quantify wildlife habitat.

The HEP was used to evaluate the quality and quantity of habitat for selected guild/indicator species within the Build Alternatives. The results of the HEP are used as a 'measuring stick' for the comparison of potential impacts and Habitat Unit (HU) production among Build Alternatives. The use of guild/indicator species allows a large group of species to be evaluated based on a small number of selected species that rely on similar habitat variables and life requisites for survival. Habitat Evaluation Procedure is a method of evaluating the quantity and quality of habitat for selected wildlife species. Generally, HEP produces information based on input data, for two types of wildlife habitat analysis:

1. Relative values of different areas at the same point in time.
2. The relative value of the same area at future points in time.

By combining the two comparisons, impacts of proposed actions on wildlife habitat may be quantified.

The collection of information concerning the suitability of a habitat for a particular species is based on the cover types the species use. A cover type in HEP is an area of land or water with similar physical, chemical, and biological characteristics that meet a specified standard of homogeneity.

In order to assess as broad a spectrum of habitat as possible and to consider habitat at the community level, guild/indicator species were used. The use of guild/indicator species allows a large group of species to be evaluated based on a small number of selected species that rely on similar habitat variables and life requisites for survival. In general, a guild is a group of species that utilize a resource in similar fashion. The guild species selected for this study represent all habitat types and forest strata (terrestrial and wetland) within the study area.

For a standard of comparison, HUs for each guild/indicator species were developed to reflect the comparative impact between the six Build Alternatives. These numbers are a tool for comparing relative values of habitat between alternatives based on potential effects to the guild/indicator species. Theoretically, if an impact, because of environmental change, is determined for one species of a particular guild then all species within that guild should be similarly affected.

The Habitat Evaluation Procedure is primarily based on the assumption that habitat can be described for selected wildlife species in terms of a HSI. This index is a number describing a value assigned to a particular habitat ranging from 0.0 to 1.0. Once a numerical value has been assigned, HUs can then be determined by multiplying the HSI and the area of the habitat.

Identification of land use and land cover classifications within the study area was conducted using USGS 1:250,000 scale Anderson Level II digital data. Land use and land cover classifications were classified in accordance with Anderson et al. (1976). Field verification of the major land cover classifications was conducted during August and October, 1994 to determine the relative accuracy of the digital data and to characterize the vegetative communities found within each land cover type. In addition, literature was reviewed and WVDNR and VADGIF personnel were contacted to obtain additional information on forest vegetation and existing wildlife resources.

Due to definitional differences between the Anderson system of classification and the USFWS classification system, the HEP team adjusted the Anderson classifications to accommodate data entry into the HSI programs (Tables IV-25 and IV-26). The following is an example: Anderson 43

Mixed Forest was converted to: UFOD-Deciduous Forest, UFOE-Evergreen Forest, USHD-Deciduous Shrubland, USHE-Evergreen Shrubland, and USSD-Deciduous Shrub Savanna. These changes were applied consistently to all Build Alternatives. All areas falling within these questionable definitions were assigned designations commensurate with their existing functions and in consideration of HSI data entry requirements on a per alternative basis.

Additionally many surface water bodies occur in areas identified in Anderson Levels Residential (Anderson 11), Commercial (Anderson 12), Industrial (Anderson 13), and other Urban or Built-Up Land (Anderson 17). Therefore, areal coverage for mapped Anderson values may not necessarily equate to the USFWS area values used for entry values of cover types in the HSI.

4.14.2 IMPACT ASSESSMENT

Land use and land cover types within the Build Alternatives are presented in Tables IV-25 and IV-26. Table IV-25 expresses area in terms of Anderson classifications. Table IV-26 reflects areas expressed as Anderson and converted to USFWS classifications for HSI data entry.

The HSIs for the guild/indicator species per Build Alternative are presented in Table IV-27. The HUs for the guild/indicator species per Build Alternative are presented in Table IV-28. The number of HUs presented in Table IV-28 does not represent the total number of HUs available within the individual Build Alternative or the potential of individual Build Alternatives to produce HUs. If the guild/indicator species accurately represent its guild, these total HU numbers would represent approximate values for the guild species. These numbers are used as a tool for comparing relative values of habitat between the Build Alternatives.

4.14.3 MITIGATION

Vegetative plantings for the purposes of stabilization, erosion, and sediment control and beautification would replace those indigenous vegetative species currently found within the confines of the Build Alternatives. While these species may not provide the same values of existing habitat, they do provide habitat value. Within the Preferred Alternative, the preponderance of the area will be planted.

TABLE IV-25
LAND USE AND LAND COVER TYPES - ANDERSON LEVEL II

Land Use and Land Cover Types	Build Alternatives													
	2		2A		2B		2C		2D		2E		PA	
	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)
11- Residential	64.01	(158.11)	155.35	(383.72)	30.44	(75.21)	121.8	(300.87)	64.01	(158.11)	30.44	(75.21)	53.98	(133.39)
12- Commercial	0	(0.00)	14.76	(36.48)	0	(0.00)	14.76	(36.48)	0	(0.00)	0	(0.00)	0.00	(0.00)
13- Industrial	16.23	(40.11)	16.23	(40.11)	7.27	(17.98)	7.27	(19.98)	16.23	(40.11)	7.27	(17.98)	7.27	(17.96)
14- Transportation	132.39	(327.12)	96.68	(238.89)	31.06	(76.74)	77.72	(192.04)	152.56	(379.45)	52.23	(129.06)	98.21	(242.67)
16- Mixed Urban or Built-Up Land	0	(0.00)	29.18	(72.09)	0	(0.00)	29.18	(72.09)	0	(0.00)	0	(0.00)	0.00	(0.00)
17- Other Urban or Built-Up Land	0	(0.00)	4.18	(10.34)	0	(0.00)	4.18	(10.34)	0	(0.00)	0	(0.00)	0.00	(0.00)
21- Crop Land or Pasture	140.22	(346.36)	69.83	(172.50)	140.22	(346.36)	69.83	(172.50)	107.5	(265.64)	111.47	(275.45)	100.74	(248.92)
41- Deciduous Forest	3546.24	8759.21	3523.79	(8703.78)	3679.45	9088.23	3657	(9032.80)	3458.99	(8547.31)	3592.20	8876.48	3564.20	8807.38
42- Evergreen Forest	186.76	(461.32)	185.46	(458.09)	193.78	(478.64)	192.47	(475.41)	187.22	(462.63)	193.78	(478.64)	193.78	(478.83)
43- Mixed Forest	0	(0.00)	0	(0.00)	0	(0.00)	0	(0.00)	0	(0.00)	0	(0.00)	0.00	(0.00)
51- Streams	2.61	(6.45)	2.08	(5.16)	2.14	(5.31)	1.62	(4.02)	2.61	(6.45)	2.14	(5.31)	2.14	(5.29)
52- Lakes	5.04	(12.45)	4.81	(11.90)	5.04	(12.45)	4.81	(11.90)	5.04	(12.45)	5.04	(12.45)	5.04	(12.45)
53 - Reservoirs	2.38	(5.89)	0	(0.00)	2.38	(5.89)	0	(0.00)	2.38	(5.89)	2.38	(5.89)	2.04	5.05
61- Forested Wetlands	0	(0.00)	0	(0.00)	0	(0.00)	0	(0.00)	0	(0.00)	0	(0.00)	0.00	(0.00)
62- Nonforested Wetlands	6.49	(16.05)	1.46	(3.63)	6.44	(15.93)	1.41	(3.51)	6.49	(16.05)	6.43	(15.94)	7.06	(17.44)
75- Strip Mines, Quarries, and Gravel Pits	114.06	(281.73)	35.75	(88.32)	35.53	(87.78)	35.75	(88.32)	114.06	(281.73)	35.53	(87.78)	114.01	(281.72)
76 - Transitional Areas	70.51	(174.16)	65.41	(161.58)	70.51	(174.16)	65.41	(161.58)	70.51	(174.16)	70.51	(174.16)	70.51	(174.16)
TOTAL	4286.93	(10588.93)	4204.99	(10386.62)	4204.26	(10384.68)	4283.21	(10581.82)	4188.59	(10350.20)	4109.43	(10154.59)	4218.98	(10,425.09)

TABLE IV-26
LAND USE AND LAND COVER TYPES - USFWS CLASSIFICATION

Land Use and Land Cover Types	Build Alternatives													
	2		2A		2B		2C		2D		2E		PA	
	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)	Hectares	(Acres)
AC - Cropland	70.11	(173.18)	34.91	(86.25)	70.11	(173.18)	34.91	(86.25)	53.75	(132.82)	57.75	(142.70)	43.32	(107.04)
AP - Pasture and Hayland	93.61	(231.23)	56.72	(140.11)	93.61	(231.23)	56.72	(140.11)	77.25	(190.89)	77.25	(190.89)	57.42	(141.88)
AU - Urban and Built-Up Land	212.67	(525.29)	316.41	(781.53)	68.78	(164.89)	254.94	(629.70)	233.84	(577.83)	89.95	(222.27)	159.46	(394.02)
LUB – Lacustrine Unconsolidated Bottom Wetland	2.38	(5.89)	0.00	(0.00)	2.38	(5.89)	0.00	(0.00)	2.38	(5.89)	2.38	(5.89)	2.04	(5.05)
PEM - Palustrine Emergent Wetland	4.34	(10.73)	0.00	(0.00)	4.34	(10.73)	1.41	(3.51)	4.34	(10.73)	4.34	(10.73)	4.82	(11.90)
PFO - Palustrine Forested Wetland	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
PSS - Palustrine Scrub/Shrub Wetland	2.15	(5.32)	1.46	(3.63)	2.10	(5.20)	0.00	(0.00)	2.15	(5.32)	2.10	(5.20)	2.24	(5.53)
R4 - Riverine, Intermittent	0.65	(1.61)	0.52	(1.29)	0.53	(1.32)	0.4	(1.00)	0.65	(1.61)	0.53	(1.32)	0.53	(1.31)
R5AB - Riverine Aquatic Bed	0.65	(1.61)	0.52	(1.29)	0.53	(1.32)	0.4	(1.00)	0.65	(1.61)	0.53	(1.32)	0.53	(1.31)
R5EM - Riverine Emergent Wetland	0.65	(1.61)	0.52	(1.29)	0.53	(1.32)	0.4	(1.00)	0.65	(1.61)	0.53	(1.32)	0.53	(1.31)
R5UB/ - Riverine Shore and Bottom Classes	0.65	(1.61)	0.52	(1.29)	0.53	(1.32)	0.4	(1.00)	0.65	(1.61)	0.53	(1.32)	0.53	(1.31)
UF - Forbland	38.02	(93.91)	11.91	(29.44)	11.84	(29.26)	11.91	(29.44)	38.02	(93.91)	11.84	(29.26)	38.00	(93.90)
UFOD - Deciduous Forest	3546.24	(8759.21)	3523.79	(8703.78)	3679.45	(9088.23)	3657.00	(9032.80)	3458.99	(8547.31)	3592.20	(8876.48)	3564.20	(8807.38)
UFOE - Evergreen Forest	186.76	(461.32)	185.46	(458.09)	193.78	(478.64)	192.47	(475.41)	186.76	(461.32)	193.78	(478.64)	193.78	(478.83)
UG - Grassland	38.02	(93.91)	11.91	(29.44)	11.84	(29.26)	11.91	(29.44)	38.02	(93.91)	11.84	(29.26)	38.00	(93.90)
USHD - Deciduous Shrubland	23.5	(58.05)	21.8	(53.86)	23.5	(58.05)	21.8	(53.86)	23.5	(58.05)	23.5	(58.05)	37.79	(93.26)
USHE - Evergreen Shrubland	23.5	(58.05)	21.8	(53.86)	23.5	(58.05)	21.8	(53.86)	23.5	(58.05)	23.5	(58.05)	37.79	(93.26)
USSD - Deciduous Shrub Savanna	38.02	(93.91)	11.91	(29.44)	11.84	(29.26)	11.91	(29.44)	38.02	(93.91)	11.84	(29.26)	38.00	(93.90)
TOTAL	4286.89	(10588.62)	4204.99	(10386.62)	4204.23	(10384.45)	4283.21	(10581.82)	4188.59	(10350.20)	4109.43	(10154.59)	4218.98	(10,425.09)

TABLE IV-27
HABITAT SUITABILITY INDICES PER BUILD ALTERNATIVE

Species	Build Alternatives						
	2	2A	2B	2C	2D	2E	PA
American woodcock	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Barred owl	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Black bear	0.52	0.49	0.54	0.49	0.51	0.54	0.54
Black-capped chickadee	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Brown thrasher	0.06	0.07	0.06	0.07	0.06	0.06	0.06
Downy woodpecker	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Eastern cottontail	0.94	0.97	0.95	0.97	0.95	0.96	0.95
Gray squirrel	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Muskrat	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Red-winged blackbird	0.28	0.25	0.28	0.26	0.28	0.28	0.28
Veery	0.10	0.10	0.10	0.10	0.10	0.10	0.10
White-tailed deer	0.97	0.99	0.98	0.99	0.98	0.98	0.98
Yellow warbler	0.55	0.55	0.55	0.55	0.55	0.55	0.55

TABLE IV-28
HABITAT UNITS PER BUILD ALTERNATIVE

Species	Build Alternatives						
	2	2A	2B	2C	2D	2E	PA
American woodcock	2166.11	2152.32	2286.21	2233.64	2115.60	2198.20	2179.73
Barred owl	2352.85	2337.87	2441.21	2426.19	2297.90	2387.73	2367.64
Black bear	2103.14	2002.83	2167.94	2041.39	2044.95	2120.4	2169.63
Black-capped chickadee	3585.30	3562.46	3719.93	3697.05	3501.53	3638.44	3607.83
Brown thrasher	239.4	269.17	242.96	278.98	233.04	239.13	240.30
Downy woodpecker	2203.46	2189.43	2286.21	2272.15	2151.98	2272.15	2217.31
Eastern cottontail	3814.26	3763.79	3915.62	3899.79	3740.96	3845.63	3886.37
Gray squirrel	2589.98	2573.54	2687.22	2670.78	2670.80	2670.78	2607.00
Muskrat	1.85	1.49	1.51	1.13	1.84	1.50	1.51
Red-winged blackbird	1.86	0.52	1.83	0.52	1.86	1.83	1.45
Veery	375.65	373.11	389.68	387.13	366.93	381.19	379.60
White-tailed deer	3988.54	3848.03	4048.72	3986.73	3873.38	3937.53	3974.77
Yellow warbler	15.02	13.64	15.02	13.64	15.02	15.02	22.07
TOTAL	23439.42	23090.20	24206.06	23911.12	23017.79	23709.53	23655.21

4.15 RARE, THREATENED, AND ENDANGERED SPECIES

4.15.1 METHODOLOGY

Rare, threatened, and endangered species investigations were conducted through a combination of agency coordination, database review, and field studies. The study area for the investigations was defined as a 5 to 8 kilometer (3 to 5 mile) wide corridor that encompassed the six Build Alternatives. The study area is located in the West Virginia counties of Mingo, McDowell, Wyoming, and Mercer; and Tazewell County, Virginia.

4.15.2 IMPACT ASSESSMENT

Two federally-listed endangered and one federally-listed threatened species may be present within all of the Build Alternatives (see Table III-20). The three species include the Indiana bat (*Myotis sodalis*), the Virginia big-eared bat (*Plecotus townsendi virginianus*), and the plant, Virginia spiraea (*Spiraea virginiana*).

The Virginia big-eared bat is known from four states which include specific counties in West Virginia (Pendleton, Grant and Tucker Counties), Virginia (Tazewell County), Kentucky (Lee Counties), and North Carolina (Avery County). Based on correspondence with the USFWS (*Volume I:Traffic/Transportation, Natural, and Physical Environment Appendix, Appendix G*), only transient occurrences of the Virginia big-eared bat are expected in the project area.

The Indiana bat (*Myotis sodalis*), has a known hibernaculum (cave where bats hibernate) within Mercer County, WV. Although the hibernaculum is beyond a five-mile radius of the King Coal Highway study area, the USFWS has determined that the entire State of West Virginia is potential summer habitat for the Indiana bat. Summer habitat, however, is not listed by the USFWS as Critical Habitat.

Critical habitat, as defined in the Endangered Species Act (ESA: 16 USC 402.03 (5) (A)), is the specific location within the geographic area occupied by the species essential to the conservation of the species which may require special management considerations or protection. Critical habitat does not include the entire geographic area which can be occupied by the threatened or endangered species (16 USC 402.03 (5) (C)). Areas of critical habitat for the Indiana bat have been designated in Kentucky, Tennessee, Illinois, Indiana, Missouri, and West Virginia.

Presently, one "critical habitat" area has been designated for this species within West Virginia. This area, commonly called Hellhole Cave, is located in Pendleton County, West Virginia, and is well outside the project area. Therefore the King Coal Highway project has no possibility of adversely affecting known critical habitat of the Indiana bat.

Sections 4(d) and 9 of the ESA, as amended, prohibit "taking" (i.e., harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without first obtaining an incidental take permit. A "taking" is termed incidental if the "taking" results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by a Federal agency or the applicant.

Field surveys were conducted in June 1999 by biologists specialized in the identification and assessment of potential Indiana bat habitat. The purpose of this survey was to determine the amount of available roosting and foraging habitat that would be removed by construction of the King Coal Highway. An Indiana bat biological Assessment (BA) was prepared (November 1999). The study limits for the BA included the assessment potential impacts within a two-mile radius of the Preferred Alternative. In summary, the BA concluded that construction of the King Coal Highway would remove approximately 1.8 percent of the available habitat within the 2 mile radius of the Preferred Alternative. This would account for approximately 74,520 hectares (184,064 acres) of potential bat foraging habitat containing approximately 1,145,216 Potential Roost Trees (PRTs) remaining within the two-mile radius of the Preferred Alternative. The remaining habitat is enough to support the entire population of Indiana bats that winter in West Virginia if they were to concentrate within the study area.

Because the closest Indiana bat critical habitat is located approximately 125 miles away from the project, the King Coal Highway will not have an adverse effect on critical habitat. Since there is potential Indiana Bat summer habitat throughout the project area the WVDOH will utilize PRT removal to reduce the possibility of an incidental take due to construction of the King Coal Highway. If, during project development, it becomes evident that PRT removal may delay or disrupt the project schedule, the WVDOH may approach the USFWS and request that mist net surveys be conducted.

Mist net surveys are currently the accepted sampling technique used to determine the presence or absence of Indiana bats by the USFWS and state natural resource agencies throughout the United States. If utilized mist net surveys will occur between May 15th and August 15th. If during the survey no Indiana bats are caught, no further mitigation is necessary. If PRTs are to be removed, they will be removed during times of bat hibernation (November 15th to March 31st) to avoid the possibility of an incidental take during construction. This method of habitat removal is consistent with other construction projects and is consistent with USFWS ESA Section 7 protocol for the Indiana bat (WVDOH,1998).

For Virginia spiraea (*Spiraea virginiana*), field studies were undertaken in August of 1999 to determine its presence or absence within the construction limits of the King Coal Highway's Preferred Alternative. No populations of Virginia spiraea were identified within the PA.

4.15.3 MITIGATION

The USFWS (letter dated December, 1999) determined that no formal ESA Section 7 consultation or mitigation plans are necessary for the Virginia big-eared bat, Indiana bat, or Virginia spiraea. Mist netting and/or PRT activities will be implemented on designated design segments as needed. Mist net surveys and PRT results will be compiled and submitted to the USFWS for concurrence.

4.16 VISUAL QUALITY

4.16.1 METHODOLOGY

Potential broad-ranged, qualitative types of visual effects of the King Coal Highway were identified based on the possible locations of the Build Alternatives (*Visual Impact Assessment for Highway Projects*, USDOT, 1990b). For the Preferred Alternative (PA), visual changes that are attributable to the proposed highway would take two forms: views of the proposed highway from various points within the PA and views from the proposed highway of the surrounding landscape.

4.16.2 IMPACT ASSESSMENT

The potential viewsheds which will be affected by the PA are relatively limited. This is attributed to the fact that roadways and development are primarily in the valleys. Thus, the views of the area are bounded by the ridges along the roads. The majority of the study area is rural. The PA will not affect areas where there are substantial numbers f viewers in a particular viewshed. This is because the development (and viewers) is along existing roads in the study area. The PA traverses primarily along ridge tops in Mingo, Wyoming, and McDowell counties. The viewshed for the PA along a ridge top would include the neighboring valleys and the other ridges along the PA and is considered a beneficial impact. Many scenic vistas will be created as the proposed highway negotiates the rugged mountains of the region, then descends into wide valleys.

4.16.3 MITIGATION

No specific mitigation is proposed for visual quality. However, seeding of slopes with locally abundant species and heavy plantings would improve the scenic quality of the viewshed by returning the landscape to a more natural looking state. These plantings would also improve the chances for successful revegetation of the right-of-way, and would reduce the chances for slope instability and erosion problems (USDOT, 1990b).

4.17 HAZARDOUS MATERIALS

4.17.1 METHODOLOGY

All facilities regulated by the state or federal government, which manage solid and hazardous waste and are located within the Build Alternatives, were identified. These facilities were identified through data obtained from Environmental Risk Information and Imaging Service (ERIIS), USEPA, WVDEP, and VADEQ. ERIIS located those facilities which have a specific address and which could be identified on maps. In addition, illegal or open dump sites were identified through coordination with county health departments, field reconnaissance, and aerial photography.

4.17.2 IMPACT ASSESSMENT

There are 32 hazardous materials sites located within the Build Alternatives (Exhibit IV-4). These sites include 11 hazardous waste generators (Resource Conservation and Recovery Act [RCRA] regulated facilities), 13 underground storage tanks (USTs), 5 leaking underground storage tanks (LUSTs), and 3 illegal dumps. Eight of the generators (Class I Hazardous Waste Sites) produce 1000 kilograms (2,200 pounds) or more of hazardous waste per month. Alternatives 2A and 2C contain the greatest number of sites (28 and 27, respectively); most of these sites (17) are USTs or LUSTs (Table IV-29). The remaining Build Alternatives have significantly fewer sites, ranging from two (PA) to six.

TABLE IV-29
HAZARDOUS MATERIALS SITES

Build Alternative	RCRA Class I	RCRA	ERNS/ Open Dump	LUST	UST	TOTAL
2	0	1	4	0	1	6
2A	8	3	0	5	12	28
2B	0	0	4	0	1	5
2C	8	2	0	5	12	27
2D	0	1	3	0	1	5
2E	0	0	3	0	1	4
PA	0	0	2	0	0	2

Note: LUST = Leaking Underground Storage Tanks.
UST = Underground Storage Tanks.
RCRA = Resource Conservation Recovery Act.
ERNS = Emergency Response Notification System

4.17.3 MITIGATION

Should the Preferred Alternative (PA) encroach within a known hazardous material site, avoidance of the site will be a priority during the preliminary design stage and the determination of right-of-way limits. The WVDOT Division of Highways'

The PA avoids all Class I sites in the study area. When avoidance of any site is not possible (e.g. avoidance alternatives would create greater adverse environmental impacts or would involve excessive costs), the early evaluation of hazardous waste locations will allow time for site management and environmental protection or mitigation. The chances of discovering unknown hazardous waste sites are remote. However, the potential added cost and adverse environmental impact warrants careful research early in this planning process.

4.18 NOISE

Noise is often defined as unwanted sound. It is emitted from many sources including highway vehicles, airplanes, factories, railroad cars, and power plants. Highway vehicle noise is a

Hazardous Waste Guidelines (1989) states that it is the WVDOT's practice to avoid known hazardous waste sites. In general, hazardous waste sites will be avoided in planning rights-of-way for highway projects when practicable. Class I sites are considered the most hazardous. Therefore, avoidance of these sites is a top priority.
composite of engine exhaust, drive train, and tire-roadway interaction.

Sound intensity is normally presented as a sound level using the unit "decibel" (dB). The decibel is used to measure either sound power or sound pressure levels. These sound pressure levels are shown as dBA L_{eq}(h). The term dBA refers to decibels on the A-weighted scale that represents the way the human ear perceives sound and the term L_{eq}(h) refers to a representative of an average sound level over an hour's time period.

Noise is a very subjective concept. Degrees of noise disturbance depend on several things; the amount and nature of the intruding noise, the relationship between the background noise and intruding noise, the type of activity occurring where the noise is heard, and the sensitivity of the receptor.

4.18.1 METHODOLOGY

Traffic noise calculations were performed using the FHWA approved TNM 1.0a The modeling accounted for absorptive sites, traffic speed, and peak hour volumes for autos, medium trucks (two-axle, six-tire), and heavy trucks (three or more axles).

Noise prediction analyses were performed for the existing year (1995) scenario and the design year (2020) scenarios. Traffic volumes for the study were derived from turning movement counts and vehicle classification counts performed by the WVDOT. Other ancillary studies were conducted by Michael Baker Jr., Inc. The peak hour volumes were used in the analysis, representing the loudest period of the day. Design speeds were used for the roadways. Traffic assumptions included a peak hour factor of 10.1%. The vehicle mix for the King Coal Highway is predicted to consist of 92.2% passenger vehicles (including vans, pickup trucks, and motorcycles), 0.7% medium trucks (two-axle/six-tires), and 7.1% heavy trucks (three or more axles), as derived from vehicle classification counts provided by WVDOT.

4.18.1.1 FHWA Noise Abatement Category and Substantial Increase Criteria

Federal Highway Administration NAC "B", representative of residences, schools, churches, and parks, was used as the criteria for sensitive receptors identified in the study area. When the NAC is approached or exceeded at any receptor location, then noise abatement must be considered for that site. The approach criteria is defined as 1 dBA less than the NAC for any of the categories. In Virginia, if the design year sound level is 10 or more dBA over the existing year sound level, then abatement must be considered. In West Virginia, if the predicted design year sound level at a sensitive receptor site is greater than 15 dBA over the existing year sound level at the same receptor site, then abatement must be considered. The approach criteria used in West Virginia and Virginia is 66 dBA for NAC B receptors.

4.18.1.2 Measured Noise Levels

Fifteen short-term measurements of approximately 10 to 20 minutes' duration were taken during the peak traffic periods. Simultaneous traffic counts were recorded for nearby roadways as applicable. These sites are shown in the Measured Noise Receptor Locations (see Exhibit III-7). Approximately 1,300 locations were then analyzed to account for areas most likely affected as result of the King Coal Highway.

Vehicle classification counts were also taken during the measurement periods to determine the percentage of passenger vehicles (including vans, pickup trucks, and motorcycles), medium trucks (two-axle/six-tires), and heavy trucks (three or more axles).

4.18.2 IMPACT ASSESSMENT

Land use determines the sensitivity of an area to noise. Residential areas are the most sensitive to noise, particularly single family homes. Land uses which are less sensitive to noise include open land, wooded areas, commercial properties, and agricultural areas.

The study area can be characterized as predominantly Forested Land, occupying approximately 88% of the study area. The remainder of the study area is characterized primarily as Urban/Built which includes Residential, Commercial, and Industrial areas. Residential, Commercial and Industrial areas are mainly located on the primary travel routes. There are also some water resources.

In the existing year (1995) and design year (2020), the number of sensitive receptors predicted to approach and/or exceed FHWA NAC is 3,062 for the No Build Alternative. Of these 3,062 sensitive receptors, 2,969 are residences, 63 are churches, 9 are cemeteries, 11 are public schools, 3 are medical facilities, 2 are athletic facilities, 1 is a recreational park, and 4 are community facilities.

Within the study area, the existing year conditions and the design year No Build Alternative modeling conducted was based on US 52 from Williamson, West Virginia to Bluefield, West Virginia. This roadway represents the current primary route between the project termini.

There are between 529 and 1,289 sensitive receptors located within a 300 meter (984 foot) corridor surrounding each Preferred or Build Alternative, as shown in Table IV-30.

TABLE IV-30
NOISE SENSITIVE RECEPTORS

Alternative	Total Sensitive Receptors	Residences	Churches	Cemeteries	Schools	Athletic Facilities	Parks	Community Facilities
2	579	558	7	13	1	0	0	0
2A	1,289	1,249	17	16	3	1	2	1
2B	529	507	7	13	1	0	1	0
2C	1,239	1,198	17	16	3	1	3	1
2D	586	565	7	13	1	0	0	0
2E	536	514	7	13	1	0	1	0
PA	550	528	7	13	1	0	1	0

Table IV-31 shows the predicted FHWA NAC impacts for the design year 2020. Alternative 2C has the greatest number (439) of receptors approaching or exceeding the FHWA criteria and Build Alternatives 2, 2D, and the Preferred Alternative have the lowest number (92) of FHWA criteria impacts. The Preferred Alternative has the lowest number (72) of FHWA criteria impacts. The majority of these sensitive receptors are residences.

Table IV-32 identifies receptors that exceed the substantial increase criteria. Alternative 2C has the greatest number (158) of substantial increases. Alternative 2 has the lowest number (49) of substantial increases. The Preferred Alternative has 57 predicted substantial increase impacts. Similar to the FHWA criteria, the majority of these are associated with residences.

TABLE IV-31
FHWA NOISE ABATEMENT CATEGORY CRITERIA IMPACTS

Alternative	Total Sensitive Receptors	Residences	Churches	Cemeteries	Athletic Facilities	Parks	Community Facilities
2	92	88	0	4	0	0	0
2A	426	413	8	5	0	0	0
2B	101	96	0	4	0	1	0
2C	439	425	8	5	0	1	0
2D	92	88	0	4	0	0	0
2E	101	96	0	4	0	1	0
PA	72	67	0	4	0	1	0

TABLE IV-32
2020 SUBSTANTIAL INCREASE CRITERIA IMPACTS

Build Alternative	Total Sensitive Receptors	Residences	Churches	Cemeteries
2	49	48	0	1
2A	151	146	4	1
2B	56	55	0	1
2C	158	153	4	1
2D	50	49	0	1
2E	57	56	0	1
PA	57	56	0	1

4.18.3 MITIGATION

The total number of noise level impacts is derived from the addition of FHWA criteria and substantial increase criteria impacts. Specific mitigation measures will be analyzed for the Preferred Alternative during the design stage. Reasonable and feasible abatement measures will be proposed and studied for those areas that warrant noise abatement consideration. Mitigation measures could include traffic management control, horizontal/vertical realignment and sound barriers. The following preferred alternative locations will warrant further noise abatement consideration during the design process. For these locations we will make specific commitments to review the increase or decrease in noise levels during final design. If found to be warranted based on reasonable and feasible variables, we will then investigate the FHWA methods for possible mitigation, including noise barriers.

Area 1 – Near US 52, Mingo County, south of Delbarton, 1 receptor.

Area 2 – US 52, Mingo County 13, south of Area 1, 8 receptors.

Area 3 – US 52, Mingo County, west of Mountain View, 1 receptor.

Area 4 – US 52, Mingo County, west of Mountain View, south of Area 3, 1 receptor.

Area 5 – US 52, Mingo County, west of Mountain View, south of Area 4, 1 receptor, 1 possible R/W acquisition.

Area 6 – US 52, Mingo County 6, west of Mountain View, 1 receptor

Area 7 – US 52, Mingo County 6, west of Mountain View, 1 possible R/W acquisition.

Area 8 – US 52, Ikes Fork, McDowell County, 2 possible R/W acquisitions.

Area 9 – WV 16, north of Maitland, McDowell County, 2 possible R/W acquisitions.

Area 10 – McDowell County 6, north of Keystone and Norfolk, 1 receptor.

Area 11 – McDowell County 6, north of Keystone and Norfolk, east of Area 12, 1 receptor.

Area 12 – Crumpler, McDowell County, south of the proposed facility, 1 possible R/W acquisition.

Area 13 – Crumpler, Wyoming County, north of the proposed facility, 1 possible R/W acquisition.

Area 14 – Mercer County 11, south of Matoaka, 1 receptor.

Area 15 – Mercer County 11/4, 1 receptor.

Area 16 – Near WV 71, Mercer County, 1 possible R/W acquisition.

Area 17 – Near WV 71, Mercer County, 4 receptors, 1 possible R/W acquisition.

Area 18 – Near WV 71, Mercer County, 4 receptors, 1 possible R/W acquisition.

Area 19 – Near WV 71, Mercer County, 1 receptor.

Area 20 – Mercer County, bet. WV 71 & WV 20, south of proposed facility, 4 receptors.

Area 21 – Mercer County, bet. WV 71 & WV 20, north of proposed facility, 5 receptors, 1 possible R/W acquisition.

Area 22 – Mercer County, bet. WV 71 & WV 20, south of proposed facility, 6 receptors.

Area 23 – Mercer County, bet. WV 71 & WV 20, south of proposed facility, 5 receptors, 2 possible R/W acquisitions.

Area 24 – Mercer County, bet. WV 71 & WV 20, east of proposed facility, 1 receptor.

Area 25 – Mercer County, bet. WV 71 & WV 20, west of proposed facility, 3 receptors.

Area 26 – Mercer County, bet. WV 71 & WV 20, west of proposed facility, 1 receptor.

Area 27 – Mercer County, bet. WV 71 & WV 20, east of proposed facility, 5 receptors.

Area 28 – Mercer County, bet. WV 71 & WV 20, west of proposed facility, 5 receptors, 1 possible acquisition.

Area 29 – East of WV 20, north of Bluefield, 2 receptors.

Area 30 – East of WV 20, south of Area 29, 2 receptors.

Area 31 – East of WV 20, south of Area 30, 1 receptor, 2 possible R/W acquisitions

Area 32 – East of WV 20, south of Area 31, 2 receptors.

Area 33 – East of WV 20, south of Area 32, 2 receptors, 2 possible R/W acquisitions

Area 34 – East of WV 20, east of Area 33, 4 receptors.

Area 35 – Mercer County, bet. WV 20 & I-77, south of proposed facility, 2 receptors

Area 36 – Mercer County, bet. WV 20 & I-77, north of proposed facility, 1 receptor.

Preliminary analysis suggests that all of the listed areas, except for Area 2, are not cost reasonable for barriers because of the small number of protected receptors. Additional estimates for Area 2 showed the following preliminary costs:

Area 2 – 8 receptors, total cost $153,600 (600 feet length x 16 feet height x $16 per ft^2), cost per protected unit $19,200. ($15,000 cost reasonable maximum in West Virginia).

Because no elevations, profiles, specific alignment, cut/fill lines and station numbers have been developed for the PA at the time of this study, the noise analysis incorporated a worst-case methodology to "capture" all possible impacts by using a direct line of sight to the receptor with no tree shielding or intervening terrain. During final design study of the PA, it is most likely that the number of impacted areas preliminarily identified will be less when incorporating the above features. WVDOH is committed to studying the impacted areas once the alignment is developed with the appropriate profiles and cut/fill lines, etc.

4.18.4 CONCLUSIONS

The total number of impacts is derived from the addition of FHWA criteria and substantial increase criteria impacts. The Build Alternative with the greatest total number of impacts is Alternative 2C. The Preferred Alternative has a predicted total of 129 impacts. For comparative purposes, the Build Alternatives are listed below, in order from the greatest to the least number of total impacted receptors (Table IV-33).

TABLE IV-33
TOTAL NUMBER OF IMPACTS BY BUILD ALTERNATIVE

Build Alternative	Total Number of Impacts
2C	597
2A	577
2E	158
2B	157
2D	142
2	141
PA	129

4.19 AIR QUALITY

The primary source of air pollution emissions associated with the King Coal Highway are those caused by motor vehicles using the roadway system. An air quality assessment was performed following the guidelines and recommendations received from the VDOT, VADEQ, WVDOT, WVDEP, and USEPA.

4.19.1 METHODOLOGY

4.19.1.1 Microscale Analysis

A microscale analysis was performed to predict the effects of Carbon Monoxide (CO) changes to local air quality from the construction of the King Coal Highway (*Noise, Air, and Energy Technical Report*, 1997). It predicts the generation and transportation of CO in the study area. The existing year 1995, proposed opening year 2000, and design year 2020 were analyzed and compared to the NAAQS. Motor vehicle emission rates were computed using USEPA's MOBILE 5.0a emissions model (USEPA, 1993). The emission factors were developed with conservative model inputs. Credits for an Inspection and Maintenance Plan (I & M) were not necessary. Carbon monoxide concentrations from highway vehicles were calculated by using CAL3QHC, a Gaussian dispersion model, and hybrid of the CALINE 3 model.

A worst-case approach was taken for nearly all meteorological conditions. Three-hundred and sixty wind directions were analyzed at 1 degree intervals to determine the maximum CO concentrations. Other factors included a wind speed of 1 meter (3.28 feet) per second, a stable atmospheric condition (E) for rural sites, a mixing height of 1000 meters (3,200 feet), and a worst case ambient temperature of -7^{o}C (20^{o}F).

Modeling was done for the peak one-hour condition. A background concentration of 1.2 parts per million for the one-hour concentration was used to account for CO sources outside the study area. This value was derived from the Greenbrier County, West Virginia rural air quality monitor (Site I.D. 54-025-0001). This background value was added to the one-hour results. Speeds for the roadways in the study area were based on posted speeds for comparison purposes.

Receptor sites were chosen at locations where the highest CO concentrations could be expected. These sites were placed on adjoining property right-of-way lines abutting the Build Alternatives and at the predicted worst intersection. These represent where the general public has access during the analysis periods.

4.19.1.2 Mesoscale Analysis

A mesoscale or "regional" analysis is not necessary for the King Coal Highway because the study area is in attainment for ozone (O_3). However, for comparative purposes of this study, a general analysis was performed for the base year 1990 (Clean Air Act Amendments), the proposed opening year 2000, and the design year 2020.

4.19.2 IMPACT ASSESSMENT

4.19.2.1 Microscale Analysis

Numerous CO sites were investigated. None of the predicted one-hour analysis sites exceeded the one-hour criteria of 35 parts per million as identified in the NAAQS. These predicted concentrations also did not exceed the eight-hour concentration criteria of nine parts per million; therefore, an eight-hour analysis was not performed because the eight-hour concentrations are always less than the one-hour concentrations. Table IV-34 shows the predicted highest one-hour CO receptor concentrations for the Preferred Alternative (Alternative 2D) and the Build Alternatives for the opening year 2000, design year 2020, as well as the existing year 1995. These concentrations are located in areas where the greatest traffic volumes are closest to a property line at the worst case intersection. These predicted concentrations also include a one-hour background level of 1.2 parts per million as derived from the Greenbrier County, West Virginia monitor.

TABLE IV-34
PREDICTED HIGHEST ONE-HOUR CARBON MONOXIDE CONCENTRATIONS (IN PARTS PER MILLION [PPM])

Alternative	Highest CO Concentration (ppm)		
	1995	2000	2020
No Build	2.5	2.3	2.2
2	n/a	1.5	1.7
2A	n/a	2.3	2.8
2B	n/a	1.5	1.7
2C	n/a	2.3	2.8
2D	n/a	1.5	1.7
2E	n/a	1.5	1.7
PA	n/a	1.5	1.7

Note: NAAQS: 1-HOUR = 35 ppm NAAQS: 8-HOUR = 9 ppm n/a = not applicable
The predicted concentrations include a background CO level of 1.2 ppm as derived from the Greenbrier County, WV monitor.

The highest predicted one-hour CO concentration for the year 2000 No-Build Alternative is 2.3 ppm. The highest predicted one-hour CO concentration for the design year 2020 No Build Alternative is 2.2 ppm. Based on these results, no exceedances of either the one- or eight-hour criteria is predicted to occur at any receptor for the No Build Alternative.

Neither the Preferred Alternative nor any of the Build Alternatives exceed the NAAQS for CO. The predicted concentrations are well below the one-hour standard of 35 ppm. The predicted concentrations are also below the eight-hour standard of 9 ppm. Therefore, an eight-hour analysis is not necessary since the eight-hour values are always lower than the one-hour values. The eight-hour values are typically 60 to 80% of the one-hour concentrations.

4.19.2.2 Mesoscale Analysis

A generalized mesoscale analysis was performed to analyze the King Coal Highway's effect on the precursors of O_3: volatile organic compounds (VOCs) and Nitrogen Oxides (NOx). Table IV-35 shows the total differences in kilograms (tons) per day between the base year 1990, opening year 2000, design year 2020 No Build Alternatives, and the opening year and design year Preferred and Build Alternatives.

TABLE IV-35
PREDICTED DAILY BASE YEAR, 2000, AND 2020 OZONE PRECURSORS

Scenario	Volatile Organic Compounds (VOC)		Nitrogen Oxides (NOx)	
	Kilograms Per Day	Tons Per Day	Kilograms Per Day	Tons Per Day
1990 Base Year	1375.46	1.5162	1891.330	2.0848
2000 No Build	966.050	1.0649	1537.720	1.6950
2000 Alternative 2	739.408	0.8151	1232.927	1.3591
2000 Alternative 2A	753.073	0.8301	1270.709	1.4007
2000 Alternative 2B	748.386	0.8249	1249.013	1.3768
2000 Alternative 2C	762.913	0.8409	1288.341	1.4201
2000 Alternative 2D	754.270	0.8315	1257.709	1.3864
2000 Alternative 2E	758.414	0.8360	1265.750	1.3952
2000 PA	762.558	0.8406	1273.791	1.4040
1990 Base Year	1375.46	1.5162	1891.330	2.0848
2020 No Build	958.520	1.0566	1610.090	1.7748
2020 Alternative 2	865.654	0.9542	1553.154	1.7121
2020 Alternative 2A	880.818	0.9709	1599.424	1.7630
2020 Alternative 2B	875.819	0.9654	1573.141	1.7341
2020 Alternative 2C	891.960	0.9832	1621.331	1.7872
2020 Alternative 2D	883.054	0.9733	1584.372	1.7465
2020 Alternative 2E	887.555	0.9783	1594.221	1.7573
2020 PA	892.056	0.9832	1604.070	1.7680

Table IV-35 indicates that the predicted VOC levels for the opening year Preferred and Build Alternatives are less than the base year and the No Build Alternative. The table also indicates that the predicted VOC levels for the design year Preferred and Build Alternatives are less than the base year and the No Build Alternative.

Table IV-35 indicates shows that the predicted NOx levels for all the opening year 2000 Preferred and Build Alternatives are less than the base year and the predicted No Build Alternative. The table also indicates that the predicted NOx levels for the design year 2020 Preferred and Build Alternatives are less than the base year. The NOx levels for the design year Alternative 2C are greater than the predicted No Build Alternative. The NOx levels for the design year Build Alternatives 2, 2A, 2B, 2D, 2E, and the Preferred Alternative are less than the No Build Alternative.

The highest predicted VOC level in the study area is 966 kilograms (1.06 ton) per day for the opening year 2000 (No Build Alternative). The highest predicted VOC level for the design year 2020 is 958 kilograms per day (1.06 ton, No Build Alternative). Both of these are less than the base year. The lowest predicted VOC level in the study area is 739 kilograms (0.82 ton) per day for the opening year 2000 (Alternative 2) and the Preferred Alternative was predicted to generate 762 kilograms (0.84 ton). The lowest predicted level for the design year 2020 is 865 kilograms (0.95 ton, Alternative 2) per day and the Preferred Alternative was predicted to generate 892 kilograms (0.98 ton).

The highest predicted NOx level in the study area is 1537 kilograms (1.70 tons) per day for the opening year 2000 (No Build Alternative). The highest predicted NOx level in the study area is 1621 kilograms (1.79 tons) per day for the design year 2020 (Alternative 2C). All of the levels are less than the base year.

The lowest predicted NOx level in the study area is 1232 kilograms (1.36 tons) per day for the opening year 2000 (Alternative 2) and the Preferred Alternative was predicted to generate 1273 kilograms (1.40 ton). The lowest predicted level in the study area is 1553 kilograms per day (1.71 tons) for the design year 2020 (Alternative 2) and the Preferred Alternative was predicted to generate 1604 kilograms (1.76 ton).

The mesoscale analysis incorporated posted speeds on the various routes used in the roadway network. The purpose of the analysis is to show all the relative differences between the Build Alternatives. Concluding, with one exception, all of Build and Preferred Alternatives for all analysis years have predicted VOC and NOx levels that are less than the base year and their respective no-build years. The only exception is Build Alternative 2C, which has design year NOx levels slightly higher than the No-Build Alternative.

4.19.3 MITIGATION

The air quality analysis did not predict any exceedances of the NAAQS for CO. Therefore, no mitigation measures are required as a result of the microscale analysis. The King Coal Highway is in an attainment area for O_3. Therefore, no mitigation measures are required as a result of the mesoscale analysis.

Construction activities can have a short-term impact on local air quality during periods of site preparation, with particulate matter, also known as fugitive dust, having the greatest impact. These impacts and mitigation measures are discussed in the construction impacts section.

4.20 ENERGY

4.20.1 METHODOLOGY

The energy analysis is a comparison of the energy requirements of the daily energy consumption for the No Build, Build, and Preferred Alternative. For the energy analysis two categories of energy consumption were analyzed: maintenance and operational. Total energy consumption is provided for a comparison of all the Alternatives.

Construction-related energy consumption is based on the construction cost of the Build Alternatives. This methodology was developed for the FHWA by the California Transportation (CALTRANS) Laboratory, *Energy and Transportation Systems* (July, 1983). It determines the total amount of joules (metric equivalent of British Thermal Units, or BTUs) required for the production and placement of materials (i.e. asphalt, structures, cut, fill) based on the project's construction cost. Approximately 131,850,000 joules (125,000 BTUs) equals 3.785 liters (1 US gallon) of fuel. There are no construction costs associated with this level of study. Therefore, they are not calculated.

Maintenance and operational energy consumption was calculated using the manual *Energy Requirements for Transportation Systems* (USDOT, 1980). Maintenance energy for the alternatives is based on an annual consumption factor of 1,265.76 x 10^8 joules (1.20 x 10^8 BTUs) per 1.7 lane kilometer (1.0 lane mile). Maintenance energies are also distributed over a typical 20-year lifespan of a roadway.

Operational energy consumption is influenced by vehicle size, vehicle weight, traffic conditions, engine size, vehicle accessories, roadway design, and driving mode. For the energy analysis, Vehicle Miles Traveled (VMTs) were developed for the Preferred and Build Alternatives for the proposed design year 2020. This data was combined with vehicle fuel consumption tables to develop total vehicle consumption totals.

Total energy requirements are the sum of the energy required for the maintenance and operation of the systems.

4.20.2 IMPACT ASSESSMENT

Table IV-36 summarizes the total energy requirement for the Preferred Alternative, Build, and No Build Alternatives. The Preferred and Build Alternatives show no appreciable differences between themselves for the total energy consumption. Additionally, the cost of construction energy can be recouped because energy consumption for all the Preferred and Build Alternatives is less than the No Build Alternative.

The alternative predicted to consume the greatest total amount of energy is the No Build Alternative. Alternative 2 is predicted to consume the least total amount of energy. The Preferred Alternative is predicted to consume less fuel annually than the No-Build Alternative, as do all the Build Alternatives. These consumption figures are for relative comparison only and as mentioned, indicate no real differences between the Build Alternatives.

TABLE IV-36
TOTAL ENERGY CONSUMPTION (FUEL)

Alternative	Maintenance Energy		Operational Energy		Total Energy	
	Annual Liters	Annual Gallons	Annual Liters	Annual Gallons	Annual Liters	Annual Gallons
No Build	38 903	10,278	40 428 678	10,681,290	40 467 582	10,691,568
2	96 686	25,544	37 086 467	9,798,275	37 183 154	9,823,820
2A	99 525	26,294	37 797 193	9,986,047	37 896 719	10,012,341
2B	98 017	25,898	37 502 140	9,908,096	37 600 157	9,933,994
2C	100 978	26,678	38 252 862	10,106,438	38 353 841	10,133,116
2D	98 630	26,058	37 831 905	9,995,220	37 930 535	10,021,278
2E	99 330	26,245	38 004 669	10,040,865	38 103 999	10,067,110
PA	100 030	26,432	38 117 433	10,086,510	38 217 463	10,112,942

4.20.3 MITIGATION

Mitigation measures for energy consumption are not normally employed, primarily due to the avoidance of environmentally sensitive areas, single family residences, commercial properties, and the basic laws of engineering. Additionally, all of the energy consumed as a result of the Preferred or Build Alternatives can be recovered because of the improved operations.

4.21 ENVIRONMENTAL PERMITS

Federal and state regulations require that various environmental permits be acquired prior to the construction of the King Coal Highway. The following permits may be required with the selection of one of the Build Alternatives.

4.21.1 FEDERAL PERMITS

- Section 404 of the Clean Water Act
- U.S. Coast Guard Bridge Permit

4.21.2 STATE PERMITS

- Section 401 of the Clean Water Act (Water Quality Certification)
- National Pollution Discharge Elimination System (NPDES)

Necessary permits will be obtained in compliance with the Integrated NEPA/404 process. For wetland impact permits, all of the pertinent technical information that has been generated for the NEPA studies will be incorporated into the permit packages. This is consistent with FHWA guidance on the coordination of NEPA studies and federal permit processing.

4.22 CONSTRUCTION IMPACTS

Construction activities for any of the Build Alternatives could affect the residences of the immediate study area and those traveling in the vicinity. These construction-related involvements could include:

- The temporary degradation of air, noise, and water quality.

- The temporary impedance to the maintenance and control of local and through traffic; additional concerns as a result of changes in traffic flow patterns.
- Delivery of community and emergency services.
- The stockpiling and disposal of construction materials.
- The use and mitigation of borrow areas.
- The temporary disruption of utilities.

The following is a discussion of anticipated construction impacts associated with the King Coal Highway.

4.22.1 AIR QUALITY

During construction of the King Coal Highway, air quality disturbances will be temporary and will primarily be the result of open burning, emissions from diesel-powered construction equipment, and dust from embankments, stockpiles, and haul roads.

All burning will be done in accordance with applicable laws, ordinances, and regulations and will be further subject to applicable provisions of the Office of Air Quality's West Virginia Administration Regulations, Chapter 126-20, Series IV.

- Slight increases in particulate levels may occur during the construction phase of the project. However, this effect will be minimized by requiring the contractor to adhere strictly to dust control measures as outlined in the WVDOT's 1994 Standard Specifications, Section 636.4 "*Aggregates and Dust Palliatives*". Where fugitive dust is likely to be a problem, effective dust control measures will be implemented following standard roadway construction procedures. These measures may include:
- Minimizing the area of exposed erodible earth.
- Stabilizing exposed earth with grass, mulch, pavement, or other cover as early as possible.
- Periodic sweeping or the application of water or stabilizing agents to the working and hauling areas.
- Covering, shielding, or stabilizing stockpiled material, as necessary.
- Using covered haul trucks.

4.22.2 NOISE

Heavy equipment operations and certain construction activities, such as pile driving, and vibratory compaction of embankments, will result in temporary noise increases within the area. All such potential impacts will be limited in duration to the actual construction period and to the immediate vicinity of the work in progress.

Any anticipated noise impacts will be confined to time periods considered relatively "noise tolerant" (generally accepted to be normal weekday working hours). In addition, temporary noise barriers could be utilized for noise mitigation as well as any additional measures recommended and contained in WVDOT's 1994 Standard Specifications may be used to decrease noise impacts during construction.

To reduce construction noise impact, the WVDOT could recommend the following mitigation measures:

- The contractor will be required to use construction equipment with operable mufflers.
- The contractor will be prohibited from working in residential areas during the hours between 10 p.m. and 6 a.m.

4.22.3 WATER QUALITY

Effects to water quality resulting from erosion and sedimentation, as well as from pollutants such as chemicals, fuels, bitumens, raw sewage, and other harmful waste, will be strictly controlled in accordance with Sections 107 and title 642 of WVDOT's Standard Specifications and Sections 107 and 303 of VDOT's *1995 Interim Metric Road and Bridge Specifications.* The contractor will be required to exercise every reasonable precaution necessary during construction to prevent pollution of rivers, streams, and impoundments. All construction discharge will be adequately filtered prior to discharge into waters and will meet the requirements of the West Virginia Administrative Relations, State Water Resources Board, Chapters 20-5 and 20-5A. The contractor will not establish any spoil (soil and rock) disposal sites within or immediately adjacent to any regulated water body. All disposal sites will be properly stabilized following closure or a prolonged period of inactivity. Turbidity control measures will be utilized to control sedimentation of nearby water bodies. In the event the contractor dumps, discharges, or spills any contaminant which may affect water quality, they will be required to immediately notify all appropriate local, state, and federal agencies and will take immediate action to contain and remove the contaminant.

4.22.4 MAINTENANCE AND CONTROL OF TRAFFIC

The maintenance of traffic, construction sequencing, and detouring will be planned and scheduled to minimize any adverse impacts to the traveling public. Signs will be used and local newspapers notified to provide ample notice of detours, closings, and other construction-related activities in order to plan alternate travel routes and accommodate time delays in advance. Traffic congestion and delays will be controlled where many construction operations are in progress at the same time. Within construction areas, traffic control measures using standard practices will be used, as outlined in West Virginia's *Traffic Control for Streets and Highway Construction and Maintenance.* Access to residences and businesses impacted by the construction, will be maintained through construction scheduling, sequencing, temporary driveway construction, and temporary connections.

Any disruption to the delivery of community and emergency services during construction will be minimal. Intersections with major local roads will be grade separated or relocated which will allow for continuous operation and access. Local police and fire departments as well as other emergency service providers will be notified well in advance of any construction-related activities to allow for prior planning with other providers, or to select alternate routes.

4.22.5 HEALTH AND SAFETY

During the course of construction, the contractor will comply with all federal, state, and local laws governing safety, health, and sanitation. All reasonable safety considerations and safeguards necessary to protect the life and health of employees on the job, the safety of the public, and the protection of property in connection with roadway construction, will be taken.

4.22.6 POLLUTION CONTROL

The construction of the King Coal Highway will consist of roadways and bridges requiring excavation of unsuitable materials, placement of embankments, and the use of materials such as aggregates, bituminous concrete, and portland cement concrete. The stockpiling and disposal of the construction and excavation materials may be visually displeasing to some of the residents along the construction corridor. However, this is a temporary condition and should pose no permanent problems with the use of the required temporary erosion control features. Temporary erosion control features could consist of berms, dikes, temporary seeding, sediment traps, fiber mats, silt fences, slope drains, mulches, crushed stone, and others, as specified in Section 642 of WVDOT's *Construction and Materials Specifications*. The contractor will be responsible for methods of placing and maintaining the necessary features of erosion control on haul roads, borrow and other materials pits, areas used for the disposal of waste materials, and other potential pollutants associated with the construction of the King Coal Highway.

The removal of structures and debris will be in accordance with local and state regulatory agencies permitting this operation. In addition, any interruptions or disconnection of public utilities will be done under close coordination with the affected utility. Any replacement systems could be constructed and tested prior to termination of the old system. This could be done to ensure that any disruptions will be kept to a minimum, such as to change from the old system to the new, and could possibly be done during non-peak periods.

During construction, the contractor will make every effort to utilize suitable excess material (rock and soil) for forming the base of embankments, connecting roads, ramps, and approaches. If there is excess material that is unsuitable, or if there is a surplus, the contractor will prepare a waste disposal plan (WVDOT, 1994). The plan will identify the location, size, and details of the site(s) as well as discuss acceptable waste and instructions for stabilization and closure. The contractor will not utilize "sensitive areas" identified on the construction plans for waste disposal. This plan will be reviewed and approved by WVDOT prior to implementation.

Existing conditions that could pose problems to the constructability of the King Coal Highway (e.g. large cuts and fills, rockfall areas, deep-mined and strip-mined areas, stream crossings and relocations) will be handled individually during the final design phase. The final alignment will be placed in the most practical location to avoid construction problem areas and sensitive natural resource areas. In-depth geotechnical research, reconnaissance, and core borings will be used to make sound engineering judgments to solve constructability problems as they arise.

4.23 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

In general, the Build Alternatives will have similar impacts on the local, short-term uses of resources and the maintenance and enhancement of long-term productivity. The construction phase of the project could cause limited adverse impacts on the human environment which are short-term. Study area surface waters could experience higher amounts of siltation than normal during construction; however, erosion, sedimentation and pollution control measures will be included in the final construction plans. Both temporary and permanent control measures will minimize adverse short-term construction effects and reduce substantial damage in the long term.

The King Coal Highway is classified as a long-term productive facility. This project, with its modern design characteristics, will provide safe and efficient vehicle operations at present and well into the future. Anticipated benefits of the King Coal Highway include a reduction in operating costs, travel time, accidents, and an increase in economic activity in the study area.

4.24 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION

Construction of the King Coal Highway will involve a commitment of a range of natural, physical, human, and fiscal resources. Land used in the construction of the proposed facility will be considered an irreversible commitment during the time period that the land is used for a highway facility. However, if a greater need arises for the land, or if the highway is no longer needed, the land could be converted to another use. At present, there are no indications that such a conversion will ever be necessary or desirable.

Considerable amounts of fossil fuels, labor, and highway construction materials such as cement, aggregate, and bituminous material will be expended in order to complete the King Coal Highway. Large amounts of labor and natural resources will be used in the fabrication and preparation of construction materials. These resources are generally not retrievable. However, they are not in short supply, and their use will not have an adverse effect upon continued availability of these resources. The King Coal Highway construction will also require a substantial expenditure of both state and federal funds which will not be directly retrievable. Indirectly, construction costs can be recovered through highway taxes, user fees (e.g. gasoline tax), and the income taxes generated by a more robust and healthy economy in the study area.

The commitment of these resources is based on the concept that the residents in the immediate area will benefit by the improved quality of the transportation system. These benefits will consist of improved accessibility and safety, savings in time, savings of fuel and the greater availability of quality services which are anticipated to out weigh the commitment of these resources.