FINAL
LAND USE ANALYSIS
and
FINAL
ENVIRONMENTAL IMPACT STATEMENT
for
THE EAST LYNN LAKE COAL LEASE

United States Bureau of Land Management

Eastern States—Milwaukee Field Office

Volume I of II

Text, Tables, and Figures

US Army Corps of Engineers®

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Case file numbers

Argus WVES-50556
Rockspring WVES-50560

FINAL
LAND USE ANALYSIS
AND
FINAL
ENVIRONMENTAL
IMPACT STATEMENT
for the
EAST LYNN LAKE COAL LEASE

Coal Lease Applications WVES-50556 and WVES-50560

Wayne County, West Virginia

EIS-ES-030-2008-0004

Volume I of II
Text, Tables and Figures

March 2009

BLM-Eastern States Milwaukee Field Office

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United States Department of the Interior

Bureau of Land Management
Eastern States Office
7450 Boston Boulevard
Springfield, Virginia 22153-3121

3400 (030)
WVES-50556
WVES-50560

March 6, 2009

Dear Reader:

Enclosed is the Final Land Use Analysis and Final Environmental Impact Statement (FLUA/FEIS) for the East Lynn Lake Coal Lease; Coal Lease Applications WVES-50556 and WVES-50560, Wayne County, West Virginia. The Bureau of Land Management (BLM) prepared the FLUA/FEIS in consultation with cooperating agencies, taking into account public comments received during this planning effort. This FLUA/FEIS analyzes the potential impacts of making BLM administered minerals available for commercial coal leasing. The FLUA/FEIS is open for a 30-day protest period beginning the date the U.S. Environmental Protection Agency (EPA) publishes its Notice of Availability of the FLUA/FEIS in the *Federal Register*.

This FLUA/FEIS was developed in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Federal Land Policy and Management Act of 1976. The Preferred Alternative in the FLUA/FEIS is the Proposed Action and is the same Preferred Alternative/Proposed Action as identified in the Draft LUA/Draft EIS, which was released on June 16, 2008. The FLUA/FEIS analyzes the potential impacts of the proposal and contains a Compact Disc (CD) of copies of all the written comments received during the public review period of the Draft LUA/Draft EIS and responses to those comments.

Comments on the Draft LUA/Draft EIS received from the public and internal BLM review were considered and incorporated as appropriate into the document. Public comments resulted in the addition of clarification text, but did not significantly change the FLUA/FEIS. If you are submitting comments to the FLUA/FEIS, please make them as specific as possible with reference to page numbers and chapters of the document. Comments that contain only opinions or preferences will not receive a formal response; however, they will be considered as part of the BLM decision-making process. Comments should be sent to Chris Carusona, BLM Project Manager, at 414-297-4463, via e-mail to *Chris_Carusona@blm.gov*, or regular mail at the Bureau of Land Management, 626 East Wisconsin Avenue, Suite 200, Milwaukee, WI 53202.

Pursuant to BLM's planning regulations at 43 CFR 1610.5-2, any person who participated in the planning process for the FLUA/FEIS and has an interest which is or may be adversely affected by the planning decisions may protest approval of the decision within 30 days from the date the EPA publishes the Notice of Availability in the *Federal Register*. For further information on filing a protest, please see the accompanying protest regulations in the pages that follow (labeled

as Attachment 1). The regulations specify the required elements of your protest. Take care to document all relevant facts. As much as possible, reference or cite the document or available records (e.g., meeting minutes or summaries, correspondence, etc.). To aid in ensuring the completeness of your protest, a protest check list is attached to this letter (labeled as Attachment 2).

E-mail and faxed protests will not be accepted as valid protests unless the protesting party also provides the original letter by either regular or overnight mail postmarked by the close of the protest period. Under these conditions, the BLM will consider the e-mail or faxed protest as an advance copy and will afford it full consideration. If you wish to provide the BLM with such advance notification, please direct faxed protests to the attention of Brenda Hudgens-Williams, BLM Protest Coordinator, at 202-452-5112, and e-mailed protests to Brenda_Hudgens-Williams@blm.gov.

All protests, including the follow-up letter (if e-mailing or faxing) must be in writing and mailed to the following address:

U.S. Postal Service:
Director (210)
Attention: Brenda Hudgens-Williams
P.O. Box 66538
Washington, D.C. 20035

Non-USPS delivery:
Director (210)
Attention: Brenda Hudgens-Williams
1620 L Street, N.W., Suite 1075
Washington, D.C. 20036

Before including your address, phone number, e-mail address or other personal identifying information in your protest, be advised that your entire protest – including your personal identifying information – may be made publicly available at any time. While you can ask us in your protest to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

The BLM Director will make every attempt to promptly render a decision on each protest. The decision will be in writing and will be sent to the protesting party by certified mail, return receipt requested. The decision of the BLM Director shall be the final decision of the Department of the Interior.

Upon resolution of all land use plan protests, the BLM will issue an Approved LUA and Record of Decision (ROD). The Approved LUA and ROD will be mailed or made available electronically to all who participated in the planning process and will be available to all parties at http://www.blm.gov/es/st/en/prog/east_lynn_lake_coal.html or by request to Mr. Carusona at the address and/or phone number identified above.

Unlike land use planning decisions, implementation decisions are not subject to protest under the BLM planning regulations, but are subject to an administrative review process, through appeals to the Office of Hearings and Appeals (OHA), Interior Board of Land Appeals (IBLA), pursuant to 43 CFR, Part 4 Subpart E. Implementation decisions generally constitute the BLM's final approval allowing on-the ground actions to proceed. Where implementation decisions are made

as part of the land use planning process, they are still subject to the appeals process or other administrative review as prescribed by specific resource program regulations once the BLM resolves the protests to land use planning decisions and issues an Approved LUA and ROD. The Approved LUA and ROD will therefore identify the implementation decisions made in the plan that may be appealed to the Office of Hearing and Appeals.

Sincerely,

Cathy Harris
Acting State Director

Enclosures (2)
1 - 43 Code of Federal Regulations 1610
2 - Resource Management Plan Protest Critical Item Checklist

Attachment 1

[Code of Federal Regulations]
[Title 43, Volume 2]
[Revised as of October 1, 2002]
From the U.S. Government Printing Office via GPO Access
[CITE: 43CFR1610.5-2]

[Page 20]

TITLE 43--PUBLIC LANDS: INTERIOR

CHAPTER II--BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR

PART 1600--PLANNING, PROGRAMMING, BUDGETING--Table of Contents

Subpart 1610--Resource Management Planning

Sec. 1610.5-2 Protest procedures.

(a) Any person who participated in the planning process and has an interest which is or may be adversely affected by the approval or amendment of a resource management plan may protest such approval or amendment. A protest may raise only those issues which were submitted for the record during the planning process.

(1) The protest shall be in writing and shall be filed with the Director. The protest shall be filed within 30 days of the date the Environmental Protection Agency published the notice of receipt of the final environmental impact statement containing the plan or amendment in the Federal Register. For an amendment not requiring the preparation of an environmental impact statement, the protest shall be filed within 30 days of the publication of the notice of its effective date.

(2) The protest shall contain:

(i) The name, mailing address, telephone number and interest of the person filing the protest;

(ii) A statement of the issue or issues being protested;

(iii) A statement of the part or parts of the plan or amendment being protested;

(iv) A copy of all documents addressing the issue or issues that were submitted during the planning process by the protesting party or an indication of the date the issue or issues were discussed for the record; and

(v) A concise statement explaining why the State Director's decision is believed to be wrong.

(3) The Director shall promptly render a decision on the protest. The decision shall be in writing and shall set forth the reasons for the decision. The decision shall be sent to the protesting party by certified mail, return receipt requested.

(b) The decision of the Director shall be the final decision of the Department of the Interior.

Attachment 2

Resource Management Plan Protest
Critical Item Checklist

The following items *must* be included to constitute a valid protest whether using this optional format, or a narrative letter.
(43 CFR 1610.5-2)

Before including your address, phone number, e-mail address, or other personal identifying information in your **protest**, be advised that your entire **protest**--including your personal identifying information--may be made publicly available at any time. While you can ask us in your **protest** to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so. All submissions from organizations and businesses, and from individuals identifying themselves as representatives or officials of organizations and businesses, will be available for public inspection in their entirety.

Resource Management Plan (RMP) (includes Land Use Analysis) or Amendment (RMPA) being protested:

Name:
Address:
Phone Number: ( )

Your interest in filing this protest (how will you be adversely affected by the approval or amendment of this plan?):

Issue or issues being protested:

Statement of the part or parts of the plan being protested:

Chapter:
Section:
Page:
(or) Map:

Attach copies of all documents addressing the issue(s) that were submitted during the planning process by the protesting party, <u>OR an indication of the date the issue(s) were discussed for the record</u>.
Date(s):

A concise statement explaining why the Assistant Director's decisions are believed to be wrong:

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ABSTRACT

This *Final Land Use Analysis and Final Environmental Impact Statement for the East Lynn Lake Coal Lease* (FLUA/FEIS) presents the analysis of environmental and social impacts that would result from underground mining of federal coal in the Coalburg/Winifrede seam. The coal proposed for mining lies under nine tracts of land in Wayne County, West Virginia and would be leased by the Bureau of Land Management (BLM).

Several government agencies are involved in the management of these tracts and are Cooperating Agencies for developing this FLUA/FEIS. The U.S. Army Corps of Engineers Huntington District (USACE) administers the East Lynn Lake Project, which includes the nine tracts of land that lie over the federal coal. The USACE East Lynn Lake Project was constructed primarily for flood control, water quality, wildlife management, and recreation. A majority of the land within the USACE East Lynn Lake Project is licensed to the West Virginia Division of Natural Resources (WVDNR) for a wildlife management area (WMA). The U.S. Office of Surface Mining, Reclamation, and Enforcement (OSM) has regulatory authority for the surface aspects of mining, such as roads, ponds, or facilities, on federal lands.

Two alternatives are considered in this FLUA/FEIS: 1) the Proposed Action and associated Reasonably Foreseeable Development Scenario (RFDS), and 2) the No Action Alternative and associated No Action Scenario (NAS). These alternatives were developed based on public input, including scoping (October through mid-December 2006); numerous meetings with state and federal agencies (Cooperating Agencies); and informal meetings with interested organizations upon their request. The issues addressed in comparing the alternatives include: 1) protection of environmental resources such as geologic, water, soil, vegetation, cultural and socioeconomic resources; 2) protection of existing designated uses; and 3) economically feasible mining methods.

The BLM identified the Proposed Action as its preferred alternative through scoping, review, and discussions involving the BLM and the Cooperating Agencies. The Proposed Action is for the BLM to offer federal coal in the Coalburg/Winifrede seam for competitive leasing. The federal coal in the Coalburg/Winifrede seam would be offered with BLM's standard terms and conditions, along with special coal lease stipulations identified by the BLM and the USACE for the protection of natural resources consistent with applicable laws, BLM and USACE policies, and the USACE *Operational Management Plan* (USACE 2006a).

Though not a final agency decision, the preferred alternative represents the BLM's view of the appropriate management direction, at this stage in the environmental review process. The BLM's preference may change based on comments received from other agencies and the public.

Responsible Official for EIS: Juan Palma
BLM–Eastern States Director
7450 Boston Blvd.
Springfield, Virginia 22153

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EXECUTIVE SUMMARY

The following *Final Land Use Analysis and Final Environmental Impact Statement for the East Lynn Lake Coal Lease* (FLUA/FEIS) presents an analysis of the environmental, social, and economic effects of the Proposed Action. The Proposed Action is to offer federal coal in the Coalburg/Winifrede seam for competitive leasing. The federal coal lies under nine tracts of land managed by the U.S. Army Corps of Engineers (USACE). The No Action Alternative is to deny the Applicants' pending lease-by-applications (LBAs).

The environmental analysis presented in this FLUA/FEIS is project-specific and incorporates by reference the following documents:

- *Final Environmental Impact Statement, East Lynn Lake, Twelvepole Creek, West Virginia (USACE 1974b)*
- *East Lynn Lake Wildlife Management Area Forest Management Plan* (Dotson 1992)
- *West Virginia Statewide Comprehensive Outdoor Recreation Plan* (WVDO 2003)
- *Land Use Master Plan, Wayne County, West Virginia* (Wayne County 2004)
- *Operational Management Plan, East Lynn Lake* (USACE, updated in 2006)
- *East Lynn Lake Wildlife Management Area; Advanced Management Plan, FY2008-2009* (WVDNR 2008).

Of these documents, only the *Land Use Master Plan* addresses subsurface resource management directly.

The U.S. Bureau of Land Management (BLM), in cooperation with the USACE, the Office of Surface Mining, Reclamation, and Enforcement (OSM), and the West Virginia Division of Natural Resources (WVDNR) conducted the environmental analysis for the *East Lynn Lake Coal Lease Land Use Analysis and Environmental Impact Statement* (LUA/EIS). A description of the federal coal leasing process, decisions to be made, and authorizing actions are described in sections 1.4 through 1.6 of the following document. The BLM is the lead federal agency in charge of the preparation of LUA/EIS. The USACE, OSM, and WVDNR are Cooperating Agencies. The U.S. Environmental Protection Agency (USEPA) and the Council on Environmental Quality (CEQ) provide oversight capabilities to the process.

General Location

The nine proposed lease tracts associated with the Proposed Action are located within the USACE East Lynn Lake Project, adjacent to the man-made reservoir East Lynn Lake, and within the East Fork of Twelvepole Creek watershed in southeastern Wayne County (figures 1.1-1 and 1.1-2).

Purpose and Need

This LUA/EIS is being prepared to respond to two LBAs received by the BLM and to analyze the impacts of leasing and the associated mining of federal coal that underlies the East Lynn Lake Project. The BLM coal leasing program encourages private development of federal coal reserves to:

- best manage the coal resource in the overall interest of the national need for energy,
- reduce dependence on foreign energy sources,
- minimize negative environmental impacts related to the use of the coal resource, and

- optimize positive economic impacts related to the use of the coal resource,

and in this case, in a manner that:

- sustains viable rural economies in the vicinity of the proposed leasing,
- protects the purpose and function of the East Lynn Lake Project, and
- extends the life of the existing, adjoining mining operations.

Proposed Action and Alternatives

The **Proposed Action** is for the BLM to offer federal coal in the Coalburg/Winifrede seam for competitive leasing. The federal coal in the Coalburg/Winifrede seam lies under nine tracts of land within the USACE East Lynn Lake Project. The proposed leasing is being considered in response to applications that Argus Energy WV, LLC (Argus) and Rockspring Development, Inc. (Rockspring) submitted under the LBA process detailed in 43 CFR 3425. The two coal companies are referred to as the Applicants.

The federal coal in the Coalburg/Winifrede seam would be offered with the BLM's standard terms and conditions, along with special coal lease stipulations identified by the BLM and the USACE for the protection of natural resources consistent with applicable laws, BLM and USACE policies, and the USACE *Operational Management Plan* (USACE 2006a). The nine proposed lease tracts encompass 13,093 acres on lands within the USACE East Lynn Lake Project in Wayne County, West Virginia (figure 1.1-1). The federal coal reserves are found in the Williamson Coal Field on the Appalachian Plateau (Trapp and Horn 1997).

Following the process defined by the *National Environmental Policy Act* (NEPA) (42 USC 4321 et seq.), the BLM prepared the *Reasonably Foreseeable Development Scenario* (RFDS; provided as appendix B) based on the proposed mining plans. If the Proposed Action is selected and the federal coal is leased, the RFDS associated with the Proposed Action would involve underground mining of the federal coal, as described in section 3.1. Rockspring's Camp Creek coal mining complex and Argus' Mine No. 8 and Mine No. 3 are located adjacent to the nine proposed lease tracts and, as existing permitted facilities, will continue to function regardless of this action and are not a part of this NEPA evaluation.

The **No Action Alternative** is to deny the Applicants' pending LBAs to lease the federal coal. If the No Action Alternative is selected, the associated No Action Scenario (NAS) would involve a continuation of existing conditions: no mining would occur under the proposed lease tracts, and existing, permitted mining of private coal reserves would continue on and under private properties that adjoin the proposed lease tracts.

No other alternatives have been carried through the detailed evaluation process. Although other alternatives were considered, only two reasonable alternatives were identified that directly address the purpose and need described below including the proposed project issues identified during the NEPA process. The various alternatives considered but eliminated from detailed analysis are described in section 2.3.

Irreversible/Irretrievable Commitment of Resources

Under the RFDS, approximately 75,978,177 in-place tons (approximately 26,275,874 clean recoverable tons) of federal coal reserves would be severed using room-and-pillar mining methods and irretrievably committed to use. If these leases are not approved, future development from adjacent mining operations will be infeasible. Development of the federal coal will be more expensive and may involve greater surface disturbance on the East Lynn Lake property. As a result, approximately 75,978,177 in-place tons of federal coal reserves would likely be rendered inaccessible and irretrievably lost to use under the NAS.

Short-term Uses versus Long-term Productivity

If the Proposed Action is selected, mining the coal reserves that lie under the nine proposed lease tracts, in conjunction with mining the adjoining, private, permitted reserves, would begin and continue over the next 10 to 15 years, extending local jobs, county tax revenue, federal coal royalty revenue, continued present quality of life, and regional energy resources. If the No Action Alternative is selected, the coal lying under the nine proposed lease tracts would likely be rendered inaccessible and irretrievably lost. The short-term use of the federal coal as presented in the RFDS is the only practical way the value of the federal coal would be realized, unless the current designated land uses change, thereby providing access to the federal coal. If the No Action Alternative is selected and the federal coal reserves are isolated, no long-term productivity would be possible because practicable access to the coal would be lost.

Agency Scoping Process

On November 6, 2007, representatives of the BLM and both Applicants met with the Wayne County Commissioners to provide an overview of the project and answer any questions that the Commissioners might have. The Commissioners indicated that they would like to be kept informed as the various stages of the NEPA process are completed, and be involved in the review process.

An agency scoping meeting was held on November 7, 2006, at the Ramada Inn Limited in Huntington, West Virginia. The purpose of the meeting was to gather information on issues and concerns of agency personnel and identify the primary issues for the EIS. Representatives from the BLM, USACE and OSM were present, as well as many agency Inter-disciplinary (ID) team members. The discussions resulted in a determination that the NEPA process for this action should focus on the following issues:

- subsidence (Geologic Resources)
- groundwater (Water Resources)
- surface water (Water Resources)
- socioeconomics (Socioeconomic Resources)
- Proposed, Endangered, Threatened, and Sensitive (PETS) species (Biological Resources)

The NEPA and CEQ guidelines require that all resources be analyzed during the process. This NEPA document addresses all resources, but has been focused on those resources identified above. The issues and concerns identified during the agency scoping process are described below.

Environmental Impact Analysis

Even though there are management documents for USACE East Lynn Lake Project, none address the management of federal coal at the project area. Therefore, under the 43 CFR 3400, this LUA/EIS for the East Lynn Lake Coal Lease is being conducted.

Chapter 3 of this FLUA/FEIS provides a description of the existing environment and an analysis of the potential environmental consequences that could result from implementation of either the RFDS associated with the Proposed Action, or the NAS associated with the No Action Alternative. The alternative scenarios are described in chapter 2. A summary of the conclusions of the environmental analysis follows.

The 17 resources listed below are evaluated for potential environmental and socioeconomic effects:

- Geology and Mineral Resources
- Surface Water Resources
- Groundwater Resources
- Soils
- Vegetation
- Fish and Wildlife
- PETS Species
- Socioeconomic Resources
- Environmental Justice
- Cultural Resources
- Paleontological Resources
- Recreation Resources
- Air Resources
- Noise
- Visual Resources
- Hazardous Materials and Waste
- Land Tenure, Use and Access

A brief comparative analysis of the Proposed Action and the No Action Alternative is provided in section 2.2 and the impacts of the alternatives for each resource are compared on table 2.2-1. For most environmental resources the Proposed Action, which would extend the life of the adjacent private mines for 10-15 years, will continue the current impacts, not add new ones. Voluntary and required protective measures are proposed to minimize potential environmental impacts. Required measures include state and federal permitting processes (OSM, WVDEP), state and federal monitoring plans (see table 2.1-1), and any stipulations resulting from this NEPA process.

Implementation of the Proposed Action and associated RFDS (provided in appendix B) is expected to provide positive social and economic benefits. Limited and temporary impacts to land tenure are

expected under the Proposed Action as well. Implementation of the No Action Alternative and the NAS would continue the baseline conditions for most resources, except for air and socioeconomics. Air resources would improve slightly if the mine processing operations were to close, due to reduced unpaved road traffic. Negative socioeconomic impacts would include loss of roughly 500-600 jobs; loss of direct, indirect and induced economic benefits; loss of severance tax and federal royalty revenues; loss of tax base for schools and social services; and a decline in demand for housing along with possible diminished property values.

Cumulative Effects Analysis

Other planned or potential actions that may have future impacts in the area are described in chapter 4. When combined with either the Proposed Action or the No Action Alternative, these activities may aggravate or mitigate impacts in the future and are presented as "cumulative effects."

To assess cumulative effects, the specialists identified activities or projects, together referred to as "actions," that have occurred in the past, are currently occurring, or are proposed to take place in the reasonably foreseeable future. These actions were identified through interviews with federal, state, and local agency representatives, examination of the *Land Use Master Plan, Wayne County, West Virginia* (Wayne County 2004), and discussions with resource companies such as oil and gas companies and coal companies, energy companies, and utility companies.

Each resource specialist identified an area of potential cumulative effects based on impacts to the specific resource. Each resource specialist then considered other past, present, and reasonably foreseeable projects that are close enough and recent enough to have noticeable remaining potential environmental impacts when considered in combination with the Proposed Action or No Action Alternative.

Public Involvement Process

Section 5.1 describes the public involvement for this Land Use Analysis/Environmental Impact Statement (LUA/EIS). The following provides a brief summary of the public involvement process undertaken for the East Lynn Lake Coal Lease NEPA process. Public involvement took place during the scoping period, the socio-economic workshop, the review period after the Draft LUA/Draft EIS (DLUA/DEIS) was issued, and will take place during a public-protest period after the Final LUA/Final EIS (FLUA/FEIS) is issued. Comments and data are also solicited from federal, state, and local agencies.

Four public meetings were held during development of the East Lynn Lake Coal Lease LUA/EIS:

- A public scoping meeting was held in the evening on November 6, 2006 in Wayne, West Virginia at the Wayne County Community Services building.
- A second, unplanned public scoping meeting was held in the evening on November 7, 2006 at the Ramada Inn Limited in Huntington, West Virginia as a result of local media misprinting the date, time, and location of the official public scoping meeting. This second scoping meeting was held at the date, time, and location that were misprinted to ensure that everyone who was misinformed had an opportunity to participate.
- A public socioeconomic workshop was held in the evening on March 27, 2007 in Wayne, West Virginia at the Wayne County Courthouse.

- A public hearing was held on July 31, 2008, allowing the public to verbally comment on the Draft Land Use Analysis and Environmental Impact Statement, in Wayne, West Virginia at the Wayne Town Hall.

Three of these public meetings were held in Wayne, West Virginia which is the county seat and commercial center of Wayne County and within 15 miles of the project site. An additional meeting was held in Huntington, West Virginia, the most populous city in the county.

The 90-day public review period of the draft LUA/ EIS was extended another 45 days, providing a total of 135 days for public review of the document. Comments were collected during the public hearing, and via e-mail and U.S. postal mail. Responses are presented in the FLUA/FEIS, appendix J.

Calls for participation in each of these meetings were announced in the local papers, as well as the *Federal Register*, and details provided to allow the public to participate in the LUA/EIS process.

The last period of public involvement, the public-protest period, will be announced when this FLUA/FEIS is released. Any person who participated in the planning process for the FLUA/FEIS and has an interest which is or may be adversely affected by the planning decisions may protest approval of the decision within 30 days from date the USEPA publishes the Notice of Availability in the *Federal Register.*

Public Scoping Process

An open house format was used for the meetings held on November 6 and 7, 2007. Personnel from the BLM, USACE, OSM, Argus, and Rockspring were present to answer questions concerning each aspect of the proposed project. Completed comment forms were collected at the open house or mailed to the address provided on the comment form by December 1, 2006, the closing date of the public scoping period.

The majority of the scoping comments indicated a concern with the potential for subsidence and related impacts to groundwater, surface water, vegetation, wildlife, and PETS species. Comments also indicated a concern about impacts to socioeconomic resources. In response to these comments, this FLUA/FEIS has a greater focus on evaluating the cumulative effects of the proposed alternatives on resources that relate to these concerns.

Socioeconomic Workshop

A public socioeconomic workshop was held in Wayne County on March 27, 2007. Several specific management issues and concerns were raised during this workshop. Participants in the workshop discussed: potential impacts associated with the proposed lease and underground mining of coal; concerns about the impact on recreational activities such as fishing at East Lynn Lake; and the desire for social and economic prosperity to be realized in Wayne County as a result of the proposed lease and mining. These issues are addressed in this document and in greater detail in the socioeconomic baseline assessment and impact analysis (BLM 2008).

Environmental Impact Statement Review Process

A Notice of Availability (NOA) announcing the availability and means of obtaining the *East Lynn Lake Coal Lease Draft LUA/Draft EIS (DLUA/DEIS)* was published in the *Federal Register* by the BLM on June 16, 2008 (73 FR 34035), and by the USEPA on June 27, 2008 (73 FR 36503), with an amended notice on July 3, 2008 (73 FR 38204).

The 90-day public review and comment period officially began with the publication of the USEPA's NOA, and was scheduled to end September 24, 2008 (73 FR 36503). The public comment period was subsequently extended by the BLM in another *Federal Register* announcement on September 9, 2008, for an additional 45 days, officially ending on November 10, 2008 (73 FR 52411).

During the public comment period the BLM held a public hearing concerning the DLUA/DEIS. This hearing was held at the Wayne Town Hall, on July 31, 2008. This *Final Land Use Analysis and Final Environmental Impact Statement for the East Lynn Lake Coal Lease* (*FLUA/FEIS*) has been modified based on the comments on the DLUA/DEIS received from the public at both the BLM hearing and via e-mail and U.S. postal service. Appendix J presents the public comments, the hearing transcript, agency review comments, congressional inquiries, and the BLM responses to the comments.

Decisions to be Made by Responsible Officials

Figure 1.1-3 shows the agencies and lists their roles and decision-making responsibilities. The BLM is the leasing authority for all federal coal reserves under the *Mineral Leasing Act* (MLA). The BLM must decide:

- whether or not to offer the federal coal that lies under the nine proposed lease tracts for competitive leasing, and
- what terms, conditions, and stipulations are needed on the lease to ensure compliance with the MLA.

The USACE is the surface management agency (SMA). Between 1977 and 1991, the USACE strove to acquire the coal estate lying under the USACE East Lynn Lake Project to protect the coal resource and the integrity of the dam and reservoir. The total cost of acquisition, including interest accrued during litigation, was $57 million in 1991 dollars.

The USACE's purchase of the coal established federal ownership of the coal. Thus, leasing of federal coal is a federal action, which triggers the NEPA review process. Had the coal remained in private ownership, no NEPA review would have been required.

The OSM has regulatory authority for the surface aspects of mining, such as roads, ponds, or facilities, on federal lands. The BLM, OSM, West Virginia Department of Environmental Protection (WVDEP), West Virginia Office of Miners' Health Safety &Training (WVMHST), and/or U.S. Mine Safety and Health Administration (MSHA) may have regulatory authority regarding the actual underground mining of the coal. Regulatory mining requirements are presented in table 2.1-1.

Under the *Surface Mining Control and Reclamation Act* (SMCRA) regulations at 30 CFR 740.4 (b)(1), the OSM is responsible for recommending to the Secretary of Interior whether to approve, disapprove, or conditionally approve the mining plans. Under 30 CFR 740.4(d)(4) / 43 CFR 3400, the BLM is to review and make recommendations related to the resource recovery and protection plan (R2P2).

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LIST OF ACRONYMS AND ABBREVIATIONS

303(d) list	state list of impaired streams
-A-	
AAQS	ambient air quality standards
ABA	acid-base accounting
ADTI	Acid Drainage Technology Initiative
AMD	acid mine drainage
AML	abandoned mine lands
AMS	analysis of the management situation
amsl	above msl (mean sea level)
AP	acid potential
Applicants	Argus Energy WV, LLC and Rockspring Development, Inc.
AOC	approximate original contour
APE	area of potential effect
APR	acid potential ratio
AQCR	Air Quality Control Region
ARC	Appalachian Regional Commission
ARMPS	BLM's analysis of retreat mining stability (modeling method)
ARPA	*Archaeological Resources Protection Act*
Argus	Argus Energy WV, LLC, also referred to as "Applicant"
ATV	all-terrain vehicle (*see* ORV)
-B-	
BAE	biological assessment and evaluation
BART	best available retrofit technology
BBER	Bureau of Business and Economic Research (WVU)
Bcf	billion cubic feet
bgs	below ground surface
BLM	U.S. Bureau of Land Management (Department of the Interior)
BLM-ES	BLM-Eastern States Office
BLM-MFO	Milwaukee Field Office of the BLM
BMP	best management practice
BTU	British thermal units
-C-	
CBER	Centers for Business and Economic Research
CCELLD	Concerned Citizens for East Lynn Lake Development
CE	categorical exclusion
CEC	Chesapeake Energy Corporation
cfm	cubic feet per minute
cfs	cubic feet per second
CFR	*Code of Federal Regulations*
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CHIA	cumulative hydrologic impact assessment
CNA-Biological	conditions not allowable–biologically impaired

CO	carbon monoxide
CSR	*Code of State Rules* (West Virginia)
CWA	*Clean Water Act*

-D-

DAAR	data adequacy and accuracy report
dBA	A-weighted decibel
Draft LUA/Draft EIS	draft land use analysis/draft environmental impact statement
DO	dissolved oxygen
DOD	U.S. Department of Defense

-E-

EA	environmental assessment
EGU	electrical generating unit
EIA	Energy Information Administration
EIS	environmental impact statement
EMT	emergency medical technician
EPA	*See*: U.S. Environmental Protection Agency
ESA	*Endangered Species Act*

-F-

FCLAA	*Federal Coal Lease Amendments Act*
FEIS	final environmental impact statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FGDC	Federal Geographic Data Committee
FLPMA	*Federal Land Policy and Management Act*
FLUA/FEIS	*Final Land Use Analysis/Final Environmental Impact Statement*
FMV	fair market value
FOIA	*Freedom of Information Act*
FR	*Federal Register*
FRCC	Fire Regime Condition Class
ft	foot

-G-

GAP	Gap Analysis Program (USGS)
GHG	greenhouse gas
Golder	Golder Associates Inc.
gpm	gallons per minute

-H-

HADCO	Huntington Area Development Area Council
HRSA	U.S. Health Resources and Services Administration
HU	hydrologic unit
HUC	hydrologic unit code
HUD	U.S. Department of Housing and Urban Development

-I-

IBI	index of biological integrity
IMPLAN	Impact Analysis for Planning (economic model)
IPCC	Intergovernmental Panel on Climate Change
ISB	Institute for Systematic Botany
ISDF	individual sewage disposal facility

-K-

KOP	key observation point
KYOVA	KentuckY Ohio [West] VirginiA Interstate Planning Commission

-L-

L_{eq}	equivalent sound pressure level
the lake	East Lynn Lake
LBA	lease by application
LNG	liquefied natural gas
LRMP	*land and resource management plan*
LUA	*land use analysis*
LUA/EIS	*Land Use Analysis/Environmental Impact Statement*
LWCFA	*Land and Water Conservation Fund Act*

-M-

MBOE	million barrels of oil equivalent
MBTA	*Migratory Bird Treaty Act*
mcf	thousand cubic feet
MCL	maximum contaminant level
MER	maximum economic recovery
mg/L	milligrams per liter
MLA	*Mineral Leasing Act*
MM&A	Marshall Miller & Associates
mmcf	million cubic feet
MOU	memorandum of understanding
MPO	metropolitan planning organization
MSA	metropolitan statistical area
MSHA	U.S. Mine Safety and Health Administration (Department of Labor)
MW	megawatt

-N-

NAAQS	national ambient air quality standards
NAD	North American Datum
NAG	non-acid generating
NAS	no action scenario
NCB	National Coal Board (U.K.)

NCDC	National Climatic Data Center
NCSL	National Conference of State Legislators
NEPA	*National Environmental Policy Act*
NGO	non-governmental organization
NHD	National Hydrography Dataset (USGS)
NHP	National Heritage Program
NHPA	*National Heritage Preservation Act*
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory (USFWS)

-O-

O_3	ozone
OHV	off-highway vehicle (*see* ORV)
ORV	Off-road vehicle
OSM	U.S. Office of Surface Mining, Reclamation, and Enforcement (USDI)

-P-

P&A	P&A Engineers and Consultants
PAG	potentially acid generating
Pb	lead
PETS	proposed, endangered, threatened and sensitive species
PFYC	potential fossil yield classification
PHC	probable hydrologic consequences
PM	particulate matter
$PM_{2.5}$	particulate matter at 2.5 microns
ppm	parts per million
PSA	preliminary subsidence analysis
PSD	USEPA prevention of significant deterioration classification
psi	pounds per square inch

-R-

R2P2	resource recovery and protection plan
REIC	R. E. I. Consultants, Inc.
RFFD	reasonably foreseeable future developments
RFDS	Reasonably Foreseeable Development Scenario
RFP	request for proposal
RMP	resource management plan
Rockspring	Rockspring Development, Inc., also referred to as “Applicant”

ROD	record of decision
ROS	Recreation Opportunity Spectrum
ROW	right of way
RQ	Superfund reportable quantity
RTE	rare, threatened and endangered (species)
RUPRI	Rural Policy Research Institute

-S-

SCORP	Statewide Comprehensive Outdoor Recreation Plan
SHPO	State Historic Preservation Office, *see* WVSHPO
SMA	surface management agency
SMCL	secondary maximum contaminant level
SMCRA	*Surface Mining Control and Reclamation Act*
SME	Society of Mining Engineers
SO_2	sulfur dioxide
SOW	statement of work
STOR	Abbreviation of "storage": sound sample identification number

-T-

T&E	threatened and endangered (species)
TDS	total dissolved solids
TMDL	total maximum daily load
TNC	The Nature Conservancy
TSCA	*Toxic Substances Control Act*
TSS	total suspended solids

-U-

U.K.	United Kingdom
UKYCBER	University of Kentucky Center for Business and Economic Research
U.S.	United States
USACE	U.S. Army Corps of Engineers (Department of the Army)
USBLM	*See*: BLM
USBM	U.S. Bureau of Mines (USDI)
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey (USDI)

-V-

VRMS	visual resources management system
VRAP	visual resources assessment procedure
VQO	visual quality objective

-W-

WAP	Western Allegheny Plateau (ecoregion)
WCC	Wayne County Commissioners
WMA	wildlife management area
WQS	water quality standards
WRDA	*Water Resources Development Act*
WROS	*Water Recreation Opportunity Spectrum*
WV	West Virginia
WVAC	WV Association of Counties
WVC	West Virginia Code
WVCA	WV Coal Association
WVAMLR	WV Office of Abandoned Mine Lands, and Reclamation
WVDCH	West Virginia Division of Culture and History
WVDEP	WV Department of Environmental Protection
WVDMR	WV Division of Mining and Reclamation
WVDNR	WV Division of Natural Resources
WVDO	WV Development Office
WVDOF	WV Division of Forestry
WV-GAP	WV GAP Analysis Program (USGS)
WVGES	WV Geological and Economic Survey
WVMSHT	WV Office of Miners' Health Safety &Training
WVNHP	WV Natural Heritage program
WVNPS	WV Native Plant Society
WVOOG	WV Office of Oil and Gas
WVSCI	WV stream condition index
WVSCORP	*WV Statewide Comprehensive Outdoor Recreation Plan*
WVSHPO	WV State Historic Preservation Office
WVU	West Virginia University
WWV	Workforce West Virginia

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

On July 14, 2005, a Notice of Intent (NOI) was published in the *Federal Register*, entitled Notice of Intent to Prepare a Land Use Analysis/Environmental Impact Statement for Coal Lease Applications WVES–50556 and WVES–50560, Wayne County, West Virginia. The Applicants, Argus Energy WV, LLC (Argus) and Rockspring Development, Inc. (Rockspring) have submitted lease-by-applications (LBAs) to lease federal coal in the Coalburg/Winifrede seam that lies under nine tracts of land. These nine tracts are located within the U.S. Army Corps of Engineers' (USACE's) East Lynn Lake Project southeast of the town of Wayne, in Wayne County, West Virginia (figures 1.1-1 and 1.1-2). Table 1.1-1 lists approximate acreages for the relevant areas.

As defined in the *Mineral Leasing Act* (MLA) (30 USC 181 et seq.), and the *Water Resources Development Act of 1999* (approved August 17, 1999), the Bureau of Land Management (BLM) is the decision-making authority regarding the leasing of the federal coal that lies under the proposed lease tracts. The BLM oversees completion of the land use analysis (LUA) and preparation of the environmental impact statement (EIS) as required by the *National Environmental Policy Act* (NEPA). The U.S. Environmental Protection Agency (USEPA) and the Council on Environmental Quality (CEQ) provide oversight and review of the LUA/EIS. The oversight and management structure for the NEPA process is shown on figure 1.1-3. Following completion of the East Lynn Lake Coal Lease LUA/EIS, the BLM will issue a decision concerning lands to be considered in any further leasing process. If the record of decision (ROD) allows leasing, a competitive leasing process would begin, followed by the mine permitting process.

In August 2005 the BLM and the Applicants signed a memorandum of understanding (MOU) to outline the NEPA process and responsibilities. On September 8, 2005 the BLM issued a statement of work (SOW) to guide preparation of proposals and on September 23, 2005, the Applicants issued a request for proposals (RFP). The Applicants and the BLM reviewed the proposals and in July 2006 Golder Associates Inc. (Golder) was selected, by the BLM, to develop the East Lynn Lake Coal Lease LUA/EIS for the BLM. Contracts between Golder and each of the Applicants were negotiated and signed in September 2006.

The initial steps of the NEPA process have been completed. Both agency and public scoping have been conducted to identify issues to be addressed in the East Lynn Lake Coal Lease LUA/EIS process, and a summary of this process is presented below in section 1.7.

Golder prepared and submitted a preliminary subsidence analysis (PSA) in May 2007 (BLM 2007d), an analysis of the management situation (AMS) in June 2007 (BLM 2007e), and a data adequacy and accuracy report (DAAR) in July 2007 (BLM 2007f). In September 2007, Rockspring changed the boundary of proposed Rockspring lease tract A, retaining total acreage, and shifting acreage to the north, even farther away from the dam and other structures. All resource specialists evaluated potential impacts to their respective resources based on this change. New information concerning soils, vegetation, and potential cultural resources was obtained.

Based on the coal lease applications received from Argus and Rockspring (the Applicants), the BLM prepared a document describing the Reasonably Foreseeable Development Scenario (RFDS), provided as appendix B to this document. If the Proposed Action is selected and the federal coal is leased, the RFDS associated with the Proposed Action would involve underground room-and-pillar mining of the federal coal using an extraction rate of approximately 50 percent, with no second mining. The RFDS is based on proposed mining plans, and was developed to facilitate the NEPA process required for the Proposed Action.

Prior to mining the federal coal, the successful bidder(s) would be required to submit mining plans and operations permit applications to federal and state agencies for approval. If deemed necessary, additional analyses may be performed at that time by the U.S. Office of Surface Mining, Reclamation, and Enforcement (OSM). If Argus and Rockspring are the successful bidders, these two companies would extend existing underground workings from their adjoining operations into the federal coal. Rockspring would produce roughly one million tons per year over a 10-year period, and Argus would produce approximately one million tons per year over a 15-year period. If another company or companies is or are the successful bidder(s), this NEPA analysis would be applicable only if the company or companies obtained an operations permit from OSM, and performed room-and-pillar mining in substantive compliance with the RFDS. Otherwise, this NEPA analysis would not apply, and the company or companies would need to complete further analyses.

As summarized in chapter 2 of this document, the Cooperating Agencies evaluated potential alternatives to the Proposed Action. A description of the federal coal leasing process, decisions to be made, and authorizing actions are described below in sections 1.4 through 1.6.

The BLM is the lead federal agency for this Proposed Action and will oversee completion of the LUA/EIS process. Golder, as the third-party contractor, is responsible for supporting the NEPA process and preparing an LUA/EIS document that meets all applicable requirements of the BLM's planning regulations (43 CFR 1600), NEPA (42 USC 4321-4347, as amended), the CEQ regulations (40 CFR 1500), and all other applicable regulations pursuant to NEPA.

1.1.1 Cooperating Agencies

A Cooperating Agency is any agency that has jurisdiction by law or special expertise for proposals covered by NEPA. A Cooperating Agency can be any federal, state, local, or tribal government agency. The USACE administers the land surface that lies over the federal coal and manages the area for flood control, recreation, and wildlife management. The OSM and the USACE have agreed to participate as Cooperating Agencies in the NEPA process as provided by 40 CFR 1501.6, and MOUs have been completed to document those agreements. The West Virginia Division of Natural Resources (WVDNR) is also a Cooperating Agency.

1.1.1a U.S. Army Corps of Engineers

The land tracts that lie over the federal coal proposed for leasing are situated within the boundaries of the USACE East Lynn Lake Project. The USACE manages these lands for flood control, recreation, and wildlife habitat. According to the USACE's *Real Estate Handbook* (ER 405-1-12), the procedure of the

USACE in acquiring the necessary land or interests to accommodate projects is to permit the reservation of the minerals in the land, unless the reservation is adverse or hostile to the operation of the project (USACE 2005). The USACE determined it necessary to acquire the coal rights in order to ensure realization of "optimum values for all [USACE East Lynn Lake Project] purposes."

The USACE considers the life of its East Lynn Lake Project to be 100 to 200 years, and has expressed concern regarding the proposed mining associated with the Proposed Action. The USACE is concerned about potential impacts to the integrity of the dam, the reservoir, and the land surface within the East Lynn Lake Project that could result from this relatively short-term project, which is expected to extend mining in the area around the lake by 10 to 15 years (Saunders 2008a, Maggard 2007a).

As the surface management agency (SMA) for those land tracts, the USACE is a stakeholder group, and is serving as a Cooperating Agency in the East Lynn Lake Coal Lease LUA/EIS preparation process.

1.1.1b U.S. Office of Surface Mining, Reclamation, and Enforcement

If the Proposed Action is selected, the BLM will initiate the competitive bidding process. The successful bidder(s) will be required to submit application(s) for operations permits to the OSM in accordance with the *Surface Mining Control and Reclamation Act* (SMCRA) Article 3. As part of the permitting process, the West Virginia Department of Environmental Protection (WVDEP) would conduct a cumulative hydrologic impact assessment for each application to determine whether the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area.

1.1.1c West Virginia Division of Natural Resources

The WVDNR maintains licenses for wildlife management areas (WMA) throughout West Virginia (WVDNR 2007b). On these WMAs, the WVDNR is able to practice more intensive wildlife management than is possible on privately owned lands. Proper techniques for the conservation and management of these habitats benefit both game and nongame wildlife species. At the USACE East Lynn Lake Project, the WVDNR manages the East Lynn Lake WMA (USACE 1983), operating under a 25-year license. The license was initially issued by the USACE on November 1, 1983, and renewed to 2033 in January, 2009 (USACE 2009). The WMA, shown on figure 1.1-4, covers 22,928 acres of the 24,833-acre USACE East Lynn Lake Project area. The East Lynn Lake WMA does not include the USACE dam and operational facilities, recreation facilities, or the "no hunting area" between the dam and marina. The WVDNR requested to participate as a Cooperating Agency, and completed an MOU with the BLM in July 2007.

1.1.2 Legal Description of Proposed Mineral Lease Tracts

This *Final Land Use Analysis and Final Environmental Impact Statement for the East Lynn Coal Lease* (FLUA/FEIS) presents an analysis of the environmental, social, and economic effects of the Proposed Action and associated RFDS, and of the No Action Alternative and the associated No Action Scenario (NAS). The Proposed Action is to lease the federal coal that lies under the nine tracts (hereafter referred to as the proposed lease tracts) proposed by the Applicants. Legal descriptions of the lease tracts are

provided as appendix A. The Applicants' respective proposed lease tract numbers are listed in table 1.1-2.

Table 1.1-2
Proposed Lease Tracts

Tract Name	Mineral Tract Numbers
ARGUS Energy WV, LLC	**WVES 50556**
Proposed lease tract A	177M-1, 177M-14, 177M-11, 1717M, 1813M, 2321M
Proposed lease tract B	177M-1, 745M, 746M, 808, 840M, 843M, 846M, 1140M, 1140, 1301, 1313M, 1330M, 1718M, 1810M, 1811M, 1813M, 2020M, 2737
Proposed lease tract C	177M-12, 177M-1, 2321M, 2430M, 2431M
Rockspring Development Inc.	**WVES 50560**
Proposed lease tract A	174M, 184M, 177M-1, 375M, 377M, 376ME-1, 376ME-2, 382M, 545M, 554M, 390ME-1, 395M, 378M, 380M, 381M, 384M, 386M, 177M-2, 430M, 556M
Proposed lease tract B	177M-1
Proposed lease tract C	430M, 177M-1, 177M-2, 382M, 545M, 553M, 554M, 550M, 547M, 548M, 745M, 1450M, 1451M, 1452M, 1453M, 517A, 517B
Proposed lease tract D	177M-1
Proposed lease tract E	177M-1, 1718M, 1717M-1
Proposed lease tract F	177M-1

1.1.3 Environmental and Social Impact Analysis

The environmental and social impact analysis was initiated by the BLM in response to applications to lease the proposed tracts, and assessed the RFDS and NAS. The analysis presented in this FLUA/FEIS is project-specific. This FLUA/FEIS incorporates by reference the following documents (as described in section 1.8):

- *Final Environmental Impact Statement, East Lynn Lake, Twelvepole Creek, West Virginia* (USACE 1974b)
- *East Lynn Lake Wildlife Management Area Forest Management Plan* (Dotson 1992)
- *West Virginia Statewide Comprehensive Outdoor Recreation Plan* (WVDO 2003)
- *Land Use Master Plan, Wayne County, West Virginia* (Wayne County 2004)
- *Operational Management Plan, East Lynn Lake* and its parts (USACE 2006a)
- *East Lynn Lake Wildlife Management Area; Advanced Management Plan, FY2008-2009* (WVDNR 2008).

These documents generally do not address subsurface resource management, given that: 1) the oil and gas estate is privately owned, 2) the USACE assumed that the federal coal would not be mined in the near future, and 3) the other subsurface resources (metals and other minerals) are held privately and not

currently being developed. However, this FLUA/FEIS specifically addresses the consequences of implementing the Proposed Action and the No Action Alternative based on the information provided by these documents as well as additional information provided by the Applicants. These plans are incorporated by reference and further described in section 1.8.

The Applicants provided information on existing, permitted and proposed operations on adjoining private lands. Additional information was gathered from the Cooperating Agencies, other federal, state, and local agencies, industry organizations, and private companies.

The BLM prepared the RFDS (appendix B) based on the Applicants' LBAs. Proposed mining would involve underground room-and-pillar mining, with approximately 50 percent extraction of the federal coal. The No Action Alternative is to deny the Applicants' pending LBAs to lease the federal coal in the Coalburg/Winifrede seam. The associated NAS would involve no change in the existing conditions or management situation within the proposed lease tracts. These alternatives are described in greater detail in chapter 2.

The Applicants propose 50 percent extraction to minimize the potential for surface subsidence. The Applicants also propose to maintain protective barriers and overburden thicknesses to minimize or prevent avoidable environmental impacts as a result of the mining. The barriers proposed are based on applicable guidance and mining engineering experience. The sizes and purposes of the proposed barriers and minimum overburden thickness are shown on table 1.1-3.

Table 1.1-3
Proposed Protective Barriers and Minimum Overburden Thickness

Barrier	Purpose/Guidance	Size
Lake protective barrier	Prevent water inflow to the mine or mine water into the lake. Based on USBM IC 8741.	200 feet
Coal outcrop barriers	Minimize or prevent potential instability where coal seam intersects land surface.	150 feet
Minimum overburden thickness	Minimize or prevent surface subsidence.	100 feet

Geologic and mineral resource specialists performed a preliminary subsidence assessment of the RFDS, and the specialists concluded that minimal subsidence would occur if the RFDS were implemented. Subsequently, resource specialists assessed the likelihood and significance of potential impacts to environmental resources, including geologic and mineral resources, water resources, soils, vegetation, and plants and animals. Based on available information, the specialists concluded that no significant impacts would occur at the USACE East Lynn Lake Project if the RFDS were implemented.

In preparation for the environmental and social analysis, the following reports were prepared to document the data available for the EIS:

- *East Lynn Lake Geology and Minerals Phase I Preliminary Subsidence Analysis (PSA)* (BLM 2007d)
- *East Lynn Lake Coal Lease Analysis of the Management Situation (AMS)* (BLM 2007e)

- *East Lynn Lake Coal Lease Data Adequacy and Accuracy Report (DAAR) sum*marized the d*ata available for use in preparing the LUA/EIS* (BLM 2007f)
- *East Lynn Lake Coal Lease Land Use Analysis and Environmental Impact Statement: Alternatives Technical Memo* (BLM 2007g)
- *East Lynn Lake Coal Lease Socioeconomic Baseline Assessment and Socioeconomic Impact Analysis* (BLM 2008b)

Based on the information provided by these documents, this FLUA/FEIS specifically addresses the consequences of implementing the Proposed Action and the No Action Alternative.

1.2 PURPOSE AND NEED

This LUA/EIS is being prepared to respond to two LBAs received by the BLM and to analyze the impacts of leasing and the associated mining of federal coal that underlies the East Lynn Lake Project. The BLM coal leasing program encourages private development of federal coal reserves to:

- best manage the coal resource in the overall interest of the national need for energy,
- reduce dependence on foreign energy sources,
- minimize negative environmental impacts related to the use of the coal resource,
- optimize positive economic impacts related to the use of the coal resource,

and in this case, in a manner that:

- sustains viable rural economies in the vicinity of the proposed leasing,
- protects the purpose and function of the East Lynn Lake Project, and
- extends the life of the existing, adjoining mining operations.

1.3 LOCATION AND DESCRIPTION

The proposed lease tracts are located in rural, mountainous southeastern Wayne County, West Virginia, approximately 20 miles south of Huntington, West Virginia and approximately 6 air miles southeast of the town of Wayne, West Virginia (figures 1.1-1 and 1.1-2). The regional climate is moderate with temperatures ranging from 19 to 82 degrees Fahrenheit. The area is predominantly forested. Elevation ranges from approximately 700 to 1,400 feet above mean sea level (amsl), and slopes range from 18 to 50 percent. Numerous small intermittent and perennial streams originate in the area and flow northward toward the Ohio River.

The proposed lease tracts are located in Wayne County, which has a population of 42,903. The town of Wayne, the county seat for Wayne County, has a population of 1,105 (U.S. Census Bureau 2000). The communities closest to the proposed lease tracts include East Lynn, Kiahsville, and Dunlow.

Coal mining, forestry, light agriculture, and recreation are important economic activities. Local communities provide education, retail, social, financial and public safety services. The area is accessed by State Routes 152 and 37, and several paved county roads. Within the lease tracts, a network of dirt, gravel, or paved roads provide access to gas wells, private family cemeteries, and utility rights of way (ROW).

The proposed lease tracts comprise slightly more than 13,000 acres of land and are situated within the USACE East Lynn Lake Project boundary. Photographs of the USACE East Lynn Lake Project are provided in appendix C (photographs C-1 through C-6). The USACE East Lynn Lake Project was constructed in 1969 for flood control and recreation, and consists of approximately 24,821 acres of land, an earth-fill dam, a roughly 1,000-acre reservoir, and associated recreation and administrative facilities. The total cost of the USACE East Lynn Lake Project, in 1969 dollars, was approximately $31 million.

In 1973, the John T. Boyd Company prepared a report entitled *Coal Land Values, East Lynn Reservoir Area for Columbia Gas Transmission Corporation* (John T. Boyd Company 1973). Referred to as the "Condemnation Report," the purpose of the study was to determine the quantity and value of coal land owned by Columbia Gas Transmission Corporation that would be adversely affected by the siting of the USACE East Lynn Reservoir. The site of the reservoir is referred to in the Condemnation Report as the "acquisition area." Within the 1973 acquisition area, the Winifrede, No. 5 Block, and Stockton-Lewiston coal seams are economically mineable, while numerous other seams are not of mineable thickness (John T. Boyd Company 1973). The Winifrede (Coalburg) reserves typically are low in sulfur, high in British thermal units (BTU), and used principally for clean electric generation (BLM 2009). As part of the condemnation activities associated with the USACE East Lynn Lake Project, coal interests were to be subordinated to the reservoir interests in certain areas. As a result, mining of the No. 5 Block and Stockton-Lewiston seams, which outcrop extensively and would normally be developed by strip or punch mining, were to be prohibited from extraction (John T. Boyd Company 1973).

The acquisition area contained approximately 25,000 acres, whereas Columbia Gas Transmission Corporation's coal lands comprised approximately 16,700 of those 25,000 acres. The boundary of the 1973 acquisition area varies slightly from the current USACE East Lynn Lake Project boundary, and the areas identified within the acquisition area vary somewhat from the current proposed lease tract boundaries. Information in the Condemnation Report indicates that in 1973 approximately 90 million tons of recoverable coal existed under roughly 23,000 acres within the current USACE East Lynn Lake Project boundary (John T. Boyd Company 1973), as shown in table 1.3-1**.**

Between 1977 and 1991, the USACE strove to acquire the coal estate lying under the USACE East Lynn Lake Project to protect the coal resource, and the integrity of the dam and reservoir. The acquisition process involved litigation. The total cost of acquisition, including interest accrued during litigation, was $57 million in 1991 dollars.

However, local coal companies indicated interest in leasing the federal coal. Eight years later, the *Water Resources Development Act of 1999* removed the USACE consent authority as an SMA and the leasing authority remained with the BLM. The USACE's purchase of the coal established federal ownership of the coal. Thus, leasing of federal coal is a federal action, which triggers a NEPA review.

1.3.1 Flood Control

The East Lynn Lake Project serves as a flood control facility along the East Fork of Twelvepole Creek and the Ohio River. Winter and spring floods are most frequent in the Twelvepole Creek drainage area. The upper area of the Twelvepole Creek is subject to headwater floods whereas the lower portion is subject to backwater floods from the Ohio River. Flooding from the Ohio River is typical in the winter

months and can last from 2 to 3 weeks. The floods on Twelvepole Creek are typically shorter in duration, anywhere from 24 to 36 hours, due to rapid runoff (USACE 1974b).

The largest flood on record on Twelvepole Creek, prior to the dam, occurred on February 4, 1939 with a discharge of 22,000 cubic feet per second (cfs). The river stage at the U.S. Geological Survey (USGS) gauging station in the town of Wayne was 31.03 feet at this time, which was 15.03 feet above the damage stage (16.0 feet). In 1974, the USACE estimated that if the dam had been present in 1939, the stage height in Wayne, West Virginia would have been reduced by 5.8 feet (reading 25.2 feet instead of 31.03 feet). It was also estimated by the USACE at this time that without the dam, flooding on Twelvepole Creek above damage stage would be expected to be equal to or greater than a total stage of 25 feet once in 5 years, 27.5 feet once in 10 years, 29 feet once in 20 years, and 30.6 feet once in 100 years. The USACE estimates that the dam prevented about $64 million in flood damages between 1971 and 2002 (McKinley 2006).

The dam, with a height above streambed of 113 feet (133 feet total), is a rolled earth-fill dam. The dam has a crest length of 652 feet and a top width of 32 feet. The crest of the dam is at an elevation of 722 feet above mean sea level (amsl), and the emergency spillway is at an elevation of 701 feet amsl. The summer pool elevation is typically 662 feet amsl, and the winter pool elevation is 656 feet amsl (USACE 2006a). The East Lynn Lake reservoir (the lake) is 12 miles long with a surface area of 1,005 acres at summer pool, when it has 44 miles of shoreline. The highest water elevation recorded to date at East Lynn Lake is 684 feet amsl. Storage capacity of the lake is 82,500 acre-feet. There is a minimum discharge flow from the lake of 10 cfs.

The Federal Emergency Management Agency (FEMA) flood maps (appendix D) show the area east and west of the lake, respectively, which are affected by the 100-year flood (FEMA 1987). The FEMA flood maps indicate that the USACE East Lynn Lake Project surrounding the lake is in Zone X. By definition, Zone X includes areas of 500-year flood; areas of 100-year flood with average depth of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from the 100-year flood.

The dam was constructed to operate indefinitely with expected operation costs. If operational upkeep is continued, the dam should continue to reduce flood stage levels into the future as it was originally intended.

1.3.2 Transportation and Access

Figure 1.3-1 shows the roads within the USACE East Lynn Lake Project and proposed lease tracts. This map shows transportation maintained by the state, county, and the USACE. The current gas companies maintain an extensive interior road system within the USACE East Lynn Lake Project.

The West Virginia Division of Forestry (WVDOF) recommends road standards for logging roads and skid trails. These recommendations include construction requirements and specifications, grading specifications, maintenance, and erosion control measures (Dotson 1992). More than 61 miles of roads are open to motor vehicles (USACE 2006a); however, some of the extensive interior road system maintained by the gas company is closed to the public. The conditions of the paved roads are considered poor to fair, while the primitive road condition is poor (Smith 2007a).

During the last 10 years, the transportation road system has remained consistent. The transportation system is expected to stay the same with varying road conditions. Motor vehicle use at the lake has grown significantly over the past five years. Some off-road vehicle (ORV) use has led to extensive environmental damage, including damage to vegetation and erosion problems. The rangers for the USACE along with the WVDNR are educating the users to stay on the established road system (USACE 2006a).

No change is predicted to the condition of the transportation road system given the current management. Much of the transportation infrastructure is already in place. The *Land Use Master Plan, Wayne County, West Virginia* indicates several proposed transportation projects in Wayne County (Wayne County 2004). The majority of transportation system efforts within the project area will be used for routine maintenance and reconstruction of older and damaged roads.

1.3.3 Facilities

According to the information available, 134 buildings exist within the USACE East Lynn Lake Project (Argus 2006a, Rockspring 2006). The USACE facilities are approximately 30 years old and are in fair to good condition (Smith 2007a). Locations of these structures are shown on figure 1.3-2. The USACE owns the following buildings and facilities:

- main office
- 5-bay equipment building
- supplies and equipment building
- flammable material storage
- carpenter shed
- intake structure
- lakeside water treatment plants (2)
- sewage treatment plants (4)

A total of 73 buildings is found within the proposed lease tracts. Table 1.3-2 summarizes the number of buildings found on each lease tract.

Table 1.3-2
Number of Buildings on Proposed Lease Tracts

Tract Name	Number of Buildings Within Lease Tract
Rockspring proposed lease tract A	0
Rockspring proposed lease tract B	1
Rockspring proposed lease tract C	4
Rockspring proposed lease tract D	0
Rockspring proposed lease tract E	1
Rockspring proposed lease tract F	0
Argus proposed lease tract A	8
Argus proposed lease tract B	47
Argus proposed lease tract C	12
Total	73

Source: Argus 2006a, Rockspring**.** 2006

The USACE buildings and structures will continue to be used. Under the current management situation, the buildings will need to be repaired and updated. The Lakeside Water Treatment Plant was replaced in 2001 (USACE 2006a). The *Operational Management Plan* (USACE 2006a) identifies planned renovations of the facilities. These plans are described in table 1.3-3.

Table 1.3-3
Description of Renovations Planned
for USACE East Lynn Lake Project Facilities

Recreation Area	Planned Renovation
Damsite Area	make the environmental building into a shelter
Lakeside Area	replace old lift station with new lift station
Operation Area	re-do and expand office complex

Source: USACE 2006a

The USACE has no plans for renovation of any of the buildings located on the proposed lease tracts. Similarly, the USACE has no plans for construction of new facilities on the proposed lease tracts (Smith 2007a).

1.4 LEASING PROCESS

1.4.1 Federal Coal Leasing Process

The federal government maintains a policy of encouraging private industry to explore and develop federal minerals, to help satisfy local and national needs. The issuance of a coal lease is a legal contract between the federal government and the lessee. This contract grants the lessee the exclusive rights to explore and develop the coal reserves in their lease. In order for a mining company to access federal coal reserves, the company must apply to lease the federal lands for development of the coal resource. A lease application is submitted to the BLM, which administers the federal mineral estate. The BLM assesses the priority of applications and initiates the lease consideration process, which includes ensuring that a NEPA analysis is completed as directed in 43 CFR 3420.1-4. For the East Lynn Lake Coal Lease LUA/EIS process, the USACE, a Cooperating Agency, is the SMA and the BLM is the lead federal agency.

1.4.2 Land Use Analysis

A coal lease sale may not be held unless the lands have been included in a comprehensive land use plan or LUA and unless the sale is compatible with, and subject to, any stipulations resulting from the land use plan or LUA in association with the environmental analysis.

Two options are provided for land use planning for coal: 1) comprehensive land use planning, and 2) planning for an LBA through an LUA. A comprehensive plan is prepared for a large area of federal coal. An LUA is prepared where there is no federal interest in the surface, or the coal deposits are insufficient to justify the costs of a comprehensive land use plan. Additionally, the filing of an LBA by an entity needing federal coal to maintain an existing mining operation is appropriately considered through the LUA process. The LUA was selected as the appropriate planning option for addressing the proposed leasing of the federal coal due to the coal resource size, land status, and the lack of a planning document that addresses the federal coal mineral estate (as directed in 43 CFR 3420).

1.4.2a Screening Levels

A screening process, defined in 43 CFR 3420.1-4, applies four steps during land use planning to identify areas acceptable for further consideration for leasing:

Screen #1: Define areas with high or medium coal development potential. Areas with no or low potential would be screened out from further consideration for leasing.

Screen #2: Identify resources or land uses with special value, as listed in the unsuitability criteria found at 43 CFR 3461.5. Only those lands passing through Screen #1 are considered in Screen #2. Lands found to be acceptable for further consideration for leasing in Screen #2, pass on to Screen #3.

The BLM or other federal agency that is the SMA describes the results of the application of each unsuitability criterion. The plan or analysis results in the identification of lands which could be leased subject to stipulations to conform to the application of the criteria. Such areas may be leased provided that these conditions or stipulations are contained in the lease.

The "underground mining exemption" is provided at 43 CFR 3461.1. In situations where mining would be by underground methods and there would be no surface operations, the unsuitability criteria do not apply. However, when applicable, the resources or uses specifically listed in the unsuitability criteria would be addressed by Screen 3 (Multiple Land Use).

Screen #3: Review multiple resource values and land uses on those lands passing through Screen #2. This screen is intended to protect non-coal resource values or land uses that are locally, regionally or nationally important or unique and are not addressed by Screen #2. An ID team of resource specialists considers and addresses the potential impacts through the preparation of an LUA. Particular emphasis is placed on protecting air and water quality, wetlands, riparian areas and sole-source aquifers. Mitigation measures are developed in the LUA for any identified negative impacts. These mitigation measures are considered and may become stipulations to proceeding with the action.

Screen #4: Require private surface owner consultation when surface mining methods are proposed on private surface. In areas where a significant number of private surface owners express preference against surface mining, these areas would be screened out from further consideration for leasing.

1.4.2b Decision Making

For proposed lease tracts containing land where the surface is under the jurisdiction of another federal SMA, the BLM requests that agency's consent to lease. With that consent, the SMA prescribes the stipulations to be imposed to protect non-mineral interests and land uses. These stipulations are derived from the LUA and environmental analysis conducted for the lease. The BLM may prescribe additional terms and conditions that are consistent with those of the SMA. However, the *Water Resources Development Act of 1999* removed the consent authority from the USACE (the SMA), while the decision-making authority regarding federal coal leasing remained with the BLM.

1.4.3 Proposed East Lynn Lake Coal Lease

The proposed lease tracts associated with the proposed East Lynn Lake Coal Lease are located on the USACE East Lynn Lake Project. Proposed mining would be by underground methods. The BLM has prepared this FLUA/FEIS to determine whether to lease the proposed coal tracts or deny the Applicants' pending LBAs. As part of the initiation of the NEPA process, the BLM issued an NOI on July 14, 2005 and requested information on the coal resource development potential of the proposed lease tracts, and resources that may be affected by coal development for lands in the vicinity of the proposed lease tracts.

Subsequently, the four-screen process, required by 43 CFR 3420.1-4 Section 1.4.2, was implemented. The proposed lease tracts pass through Screen #1 (coal development potential) because a high development potential exists based on the core hole and other data available for the tracts. Screen #2 (Review of Unsuitability Criteria) is not applicable because surface coal mining operations would not occur on the tracts (43 CFR 3461.1). Because none of the lands in the tracts have been eliminated by Screens #1 or #2, the entire area of the LBA is addressed in Screen #3 (Multiple Land Use) to determine what lands can be further considered for leasing. This screen is carried out by addressing site-specific resource values or uses during the NEPA environmental analysis contained in this FLUA/FEIS. Because

the entire area of the LBA is managed by the USACE or WVDNR and surface mining is not being considered, Screen #4 is not applicable.

Based on this screening process and information in this FLUA/FEIS, the BLM will decide on the Proposed Action (chapter 2). If the decisions result in offering of the tracts for leasing, the BLM will proceed with the leasing process, which is a three-step process that involves preparation of geologic, engineering, and maximum economic recovery information; preparation, review, and finalization of an LUA; preparation for and conducting the lease sale; review of received bids, consultation with the U.S. Attorney General, and issuance of lease(s). Before any mining can take place on a federal coal lease, a mine permit must be obtained by the lessee or operator through the OSM.

1.5 RELATIONSHIP TO POLICIES, PLANS, AND PROGRAMS

1.5.1 Federal Acts

The *National Environmental Policy Act of 1969* (NEPA) was enacted to:

- declare a national policy that will encourage productive and enjoyable harmony between man and his environment,
- promote efforts that will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man,
- enrich the understanding of the ecological systems and natural resources important to the nation, and
- establish a Council on Environmental Quality.

NEPA requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions, and reasonable alternatives to those actions. To meet this requirement, federal agencies may prepare documents such as environmental assessments (EAs), categorical exclusions (CEs), or detailed statements known as environmental impact statements (EISs). For the proposed expansion of Rockspring's Camp Creek Mine and Argus's currently inactive Mine No. 3 and active Mine No. 8 into coal reserves that lie under the proposed lease tracts, the BLM has prepared this LUA/EIS.

The *Surface Mining Control and Reclamation Act* (SMCRA) was enacted to:

(a) establish a nationwide program to protect society and the environment from the adverse effects of surface coal mining operations;
(b) assure that the rights of surface landowners and other persons with a legal interest in the land or appurtenances thereto are fully protected from such operations;
(c) assure that surface mining operations are not conducted where reclamation as required by this Act is not feasible;
(d) assure that surface coal mining operations are so conducted as to protect the environment;
(e) assure that adequate procedures are undertaken to reclaim surface areas as contemporaneously as possible with the surface coal mining operations;
(f) assure that the coal supply essential to the Nation's energy requirements, and to its economic and social well-being is provided and strike a balance between

protection of the environment and agricultural productivity and the Nation's need for coal as an essential source of energy;

(g) assist the States in developing and implementing a program to achieve the purposes of this Act;

(h) promote the reclamation of mined areas left without adequate reclamation prior to the enactment of this Act and which continue, in their unreclaimed condition, to substantially degrade the quality of the environment, prevent or damage the beneficial use of land or water resources, or endanger the health or safety of the public;

(i) assure that appropriate procedures are provided for the public participation in the development, revision, and enforcement of regulations, standards, reclamation plans, or programs established by the Secretary or any State under this Act;

(j) provide a means for development of the data and analyses necessary to establish effective and reasonable regulation of surface mining operations for other minerals;

(k) encourage the full utilization of coal resources through the development and application of underground extraction technologies;

(l) stimulate, sponsor, provide for and/or supplement present programs for the conduct of research investigations, experiments, and demonstrations, in the exploration, extraction, processing, development, and production of minerals and the training of mineral engineers and scientists in the field of mining, minerals resources, and technology, and the establishment of an appropriate research and training center in various States; and

(m) wherever necessary, exercise the full reach of Federal constitutional powers to insure the protection of the public interest through effective control of surface coal mining operations.

1.5.2 BLM Policies and Programs

The proposed mining described in the RFDS (appendix B) is in conformance with the BLM's 2008 *Mineral Policy*, which is intended to carry out pertinent sections of several laws including:

- The ***Mining and Minerals Policy Act of 1970*****–**declares that it is the continuing policy of the federal government to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. This act includes all minerals, including sand and gravel, geothermal resources, coal, and oil and gas.
- The ***Federal Land Policy and Management Act of 1976*****–**reiterates that the 1970 *Mining and Minerals Policy Act* shall be implemented and directs that public lands be managed in a manner that recognizes the nation's need for domestic sources of minerals and other resources.
- The ***Energy Policy Act of 2005*****–**encourages energy efficiency and conservation; promotes alternative and renewable energy sources; reduces dependence on foreign sources of energy; increases domestic production; modernizes the electrical grid; and encourages the expansion of nuclear energy.

The BLM *Mineral Policy* also states that:

> ...The BLM will adjudicate and process mineral patent applications, permits, operating plans, mineral exchanges, leases, and other mineral use authorizations for public lands in a manner to prevent unnecessary and undue degradation, and in a

> timely and efficient manner, and will require financial assurances to provide for reclamation of the land and for other purposes authorized by law. Mine closure and reclamation considerations include alternative forms of use such as for landfills, wind farms, biomass facilities and other industrial uses, to attract partnerships to utilize the existing mine infrastructure for a future economic opportunity.
>
> ….The BLM land use planning and multiple-use management decisions will recognize that, with few exceptions, mineral exploration and development can occur concurrently or sequentially with other resource uses. The least restrictive stipulations that effectively accomplish the resource objectives or uses will be used. The BLM will coordinate with surface owners when the Federal minerals estate under their surface ownership is proposed for development.

Objectives of the BLM coal management program, as stated in the BLM *Coal Management Manual* (BLM 1986) are to:

- give the nation a better assurance of meeting its national energy needs,
- promote economically efficient and environmentally sound patterns of federal coal leasing within the framework of multiple use resource management and compatibility with state and local land use plans,
- receive fair market value for all federally leased coal,
- protect environmental values and fully consider the views of affected states, tribes, and local governments, and
- promote the development of existing federal coal leases in an economically efficient, environmentally sound manner.

1.5.3 Resource Management Plans (Land Use Planning)

The USACE purchased land in southern Wayne County, West Virginia in the 1960s and constructed the dam from 1968 through 1971, filling East Lynn Lake in 1972 (USACE 1982). The USACE began the process of acquiring the coal estate that lies under the USACE East Lynn Lake Project in 1977, and acquired the coal estate in 1991. The *Water Resources Development Act of 1999* removed the consent authority of the USACE as an SMA given under 43 CFR 3400.3, and the leasing authority remained with the BLM. The USACE retains management of the surface estate.

The USACE manages the land surface, reservoir, and recreation facilities within the USACE East Lynn Lake Project boundary. The WVDNR manages 22,928 acres (excluding the dam/outlet structures, USACE administrative facilities, and recreation developments) under a license issued by the USACE in 1983, renewed in 2009 until 2033 (USCE 2009).

The BLM does not manage the surface of the USACE East Lynn Lake Project. As a result, the BLM has no planning documents for the proposed lease area. Since there are no planning documents that address federal coal leasing in the USACE East Lynn Lake Project area, this FLUA/FEIS is being conducted as directed by 43 CFR 3420.

1.5.4 USACE East Lynn Lake Project Policies, Plans, and Programs

Two plans that are specific to the USACE East Lynn Lake Project are the *Operational Management Plan*, *East Lynn Lake* (USACE 2006a) and the *East Lynn Lake Wildlife Management Area Forest Management Plan* (Dotson 1992), as amended by *East Lynn Lake Wildlife Management Area, Advanced Management Plan, FY2008-2009* (WVDNR 2008). Neither of these plans directly addresses issues regarding subsurface resource management.

Both of these plans contain extensive inventory information and descriptions regarding timber and forest products harvest management. The license and plans point out that proceeds from sales would come back to the USACE East Lynn Lake Project area for management activities. To date there have been no sales or even intensive forest management activities. There is a high probability that there will be sales and increased forest management activity in the near future, most likely as a result of the expiration and review and revision of the license (Smith 2007a). These plans are incorporated by reference and further described in section 1.8.

1.5.4a East Lynn Lake Operational Management Plan

The *Operational Management Plan* (USACE 2006a: Part I, Natural Resource Management) implements the objectives of governing state and federal legislation. Federal legislation relevant to the East Lynn Lake Project cited by the plan includes:

- The ***Forest Cover Act*** (Public Law 86-717) encourages multiple uses of project lands and directs the Chief of Engineers to provide for the protection and development of forest or other vegetative cover.
- The ***Endangered Species Act of 1973*** (Public Law 93-205) directs all other federal departments and agencies to consult with the Secretary of the Interior, to assure that federal programs do not jeopardize the continued existence of endangered species and threatened species or result in the destruction or modification of habitat of such species determined to be critical.
- The ***National Environmental Policy Act of 1969*** (Public Law 91-190) pertains to the management of natural resources at East Lynn Lake, specifying the processes to be used to assess, document and determine the best use of natural resources and the environmental implications of all federal actions.
- The ***Water Resources Development Act of 1990*** declares environmental protection as a primary mission of the USACE.

Other guiding documents for the East Lynn Lake Project are in the *Operational Management Plan.*

- The ***Design Memorandum No. 4-C, [East Lynn Lake] Master Plan*** (August 1984). Objective 7 is "to conserve the natural resources of the project through the use of a coordinated land management program." The original Fish and Wildlife Management Plan (Appendix E to the *Design Memorandum*), which was written within the scope of PL 93-205, PL 89-624, and USACE Engineer Regulations (ER), contains the following statement:

  The general basis for wildlife management in fee-owned lands at East Lynn Lake is to increase wildlife carrying capacity and species diversity by improving habitat.

- The Historic Preservation Program assures that existing and future natural resource management actions conserve significant, scarce, non-renewable historic resources.

1.5.4b East Lynn Lake Wildlife Management Area Forest Management Plan

The *East Lynn Lake Wildlife Management Area Forest Management Plan* was prepared by the WVDNR in 1992 to implement the license agreement issued to the WVDNR by the USACE in 1987 (Dotson 1992) and renewed in January of 2009 (USACE 2009). The plan was amended by the *East Lynn Lake Wildlife Management Area; Advanced Management Plan, FY2008-2009* (WVDNR 2008). This plan has a single stated objective, which is very general, is not quantitative or measurable, and has no time limit:

> The general management objective is to enhance the wildlife and forest resources maximizing wildlife related opportunities while protecting the land, forest, and water from damage or degradation.

There are several more specific objectives that deal with the details of forest management including harvest methods, silvicultural practices, age classes, cutting rotation, and protection areas but they have not been implemented to date and are not specific to the issues being addressed in this FLUA/FEIS. The *East Lynn Lake Wildlife Management Area; Advanced Management Plan, , FY2008-2009* (WVDNR 2008), an update to the 1992 document, is incorporated by reference and discussed in further detail in section 1.8.

1.5.5 State of West Virginia Policies, Plans, and Permits

The West Virginia Development Office **(**WVDO) developed the *West Virginia Statewide Comprehensive Outdoor Recreation Plan* (WVSCORP) (2003) in coordination with dozens of state, local, and federal agencies, including the USACE and the WVDNR. States are required to prepare a comprehensive recreation plan in order to apply for funding from the *Land and Water Conservation Fund Act* (LWCFA) and the *Transportation Equity Act for the 21st Century* for transportation enhancements.

The WVSCORP, recognizing the increasing importance of recreation and tourism in West Virginia, includes Wayne County in the "Coal Heritage Area." The following six goals listed in the plan are relevant to the USACE East Lynn Lake Project (WVDO 2003):

- capitalize all funding sources
- promote community development
- coordinate and encourage preventive health
- maintain existing facilities
- protect critical natural habitats
- expand technical and educational resources

This plan also identifies the following priorities for the LWCFA for West Virginia (WVDO 2003).

Facility Priorities

- renovate or expand state or local parks
- provide funding assistance for the reconstruction of, or addition to, local park systems
- provide funding assistance for the acquisition of conservation areas

- provide funding assistance for the reclamation of environmentally-damaged urban areas or floodplains

Activity Priorities

- provide funding assistance
- develop a LWCFA program plan
- establish a state trails coordinator

1.5.6 U.S. Office of Surface Mining Permit Regulations

The OSM has regulatory authority for the surface aspects of mining (e.g. roads, ponds, facilities) and underground mining on federal lands. Under SMCRA regulations at 30 CFR 740.4(b)(1), the OSM is responsible for recommending to the Secretary of Interior whether to approve, disapprove, or conditionally approve the mining plans.

If the Proposed Action is selected and the leases for the proposed lease tracts are issued, the successful bidder would be required to submit mining plans to the OSM for approval, and to obtain an operations permit from OSM prior to mining the federal coal.

As stated in 30 CFR 740.13(b)3(iii),

> Where OSM is the regulatory authority or where the proposed operations are on lands containing leased Federal coal, the following supplemental information shall be included to ensure compliance with Federal laws and regulations other than the *Surface Mining Control and Reclamation Act of 1977* (30 USC 1201 et seq. and 30 USC 181 et seq):
>
> (A) A description of the affected area of the proposed surface coal mining and reclamation operation with respect to:
>
> (1) Increases in employment, population and revenues to public and private entities, and
>
> (2) the ability of public and private entities to provide goods and services necessary to support surface coal mining and reclamation operations.
>
> (B) An evaluation of impacts to the scenic and aesthetic resources, including noise on the surrounding area, due to the proposed surface coal mining and reclamation operation.
>
> (C) A statement, including maps and ownership data as appropriate, of any cultural or historical sites listed on the National Register of Historic Places within the affected area of the proposed surface coal mining and reclamation operation.
>
> (D) A statement of the classes of properties of potential significance within the disturbed area, and a plan for the identification and treatment, in accordance with 36 CFR part 800, of properties significant and listed or eligible for listing on the National Register of Historic Places within the disturbed area of the proposed surface coal mining and reclamation operation.
>
> (E) A description of the probable changes in air quality resulting from the mining operation and any necessary measures to comply with prevention of significant

deterioration limitations, State Implementation Plans, or other Federal or State laws for air quality protection.

(F) A description of the location, acreage and condition of important habitats of selected indicator species located within the affected area of the proposed surface coal mining and reclamation operation.

(G) A description of active and inactive nests and prey areas of any Bald or Golden eagles located within the affected area of the proposed surface coal mining and reclamation operations.

(H) A description of all threatened and endangered species and their critical habitats located within the affected area of the proposed surface coal mining and reclamation operations.

1.5.7 Local Policies, Plans, and Programs

Wayne County developed the *Land Use Master Plan, Wayne County, West Virginia* (Wayne County 2004) in compliance with West Virginia Senate Bill 603 (2001) to improve post-mine use and reclamation of surface mines. The Wayne County Commission (WCC) approved the plan on March 22, 2004. The plan, developed for the county by a consultant, involved a steering committee established by the county and headed by the President of the WCC. The commission collected data and participated in the analysis.

This plan provides a history of the county and summarizes the county's socioeconomic data. It also includes descriptions of existing and planned infrastructure, identifies all of the existing surface mines, and describes some of the recreation resources in the county. The plan identifies some environmental issues, specifically involving water quality in relation to state and federal standards and includes a map of existing and planned public service districts that provide water and/or sewer service. The plan notes that the USACE East Lynn Lake Project area and the private lands to the east and south are poorly served for water and sewer.

The Wayne County plan also includes a map called the "Wayne County Development Authority Land Use Master Plan" which includes the following information:

- political boundaries
- mine permit areas and industrial sites
- corporate limits
- public lands
- presumptive tier 2.5 waters
- water supply systems (existing and proposed)
- sanitary sewer supply systems (existing and proposed)
- future highways and proposed roadways
- intersections or interchanges (existing and proposed)
- land utilization areas (½ mile radius, 0 to 1 mile, 1 to 2 miles, 2 to 3 miles, 3 to 5 miles and 5 to 10 miles)

The plan provides some options for post-mine use and sets standards for infrastructure development to take advantage of the altered topography. It allows the reclamation to be done so that restoring the area to the approximate original contour (AOC) as required in the legislation is not required if it can be used for other purposes. The plan includes the land use criteria in table 1.5-1 based on the distance from interstate, U.S. routes, and state routes.

Table 1.5-1
Future Land Use Criteria
Land Use Master Plan, Wayne County, West Virginia

Distance from Roadway	Future Land Use
0 to 1 mile	Industrial Commercial/Retail Residential Public Facility Recreation
1 to 2 miles	Industrial Commercial/Retail Residential Public Facility
2 to 3 miles	Industrial Commercial/Retail Residential Recreation
3 to 5 miles	Industrial Residential Recreation Agricultural Forest Land
5 miles and beyond	Industrial Residential Agricultural Forest Land

1.6 AUTHORIZING ACTIONS AND DECISIONS TO BE MADE BY RESPONSIBLE OFFICIALS

The BLM is the leasing authority for all federal coal reserves under the *Mineral Leasing Act* (MLA). For this Proposed Action, the BLM must decide:

- whether or not to offer the proposed federal coal in the Coalburg/Winifrede seam under the nine land tracts for competitive leasing, and
- what terms, conditions, and stipulations are needed on the lease to ensure compliance with the MLA.

The BLM has regulatory authority for leasing of federal coal and for determining the amount of federal coal removed. Under 30 CFR 740.4(d)(4) / 43 CFR 3400, the BLM is to review and make

recommendations to the Secretary of the Interior related to the resource recovery and protection plan, or R2P2.

The USACE is the SMA but lost consent authority by the *Water Resources Development Act of 1999*. As designated by the regulations implementing the MLA, found at 43 CFR 3480.0-6(3), the BLM is the decision-making authority regarding the leasing of the federal coal that lies under the proposed lease tracts. The USACE provided independent comment and recommendations, which the BLM is incorporating in the FLUA/FEIS where possible.

The OSM has regulatory authority for the surface aspects of mining (e.g. roads, ponds, facilities) on federal lands. Under SMCRA regulations at 30 CFR 740.4(b)(1), OSM is responsible for recommending to the Secretary of Interior whether to approve, disapprove, or conditionally approve the mining plans for mining proposed on lands contained within federal lease areas. In this regard, the OSM reviews potential surface impacts prior to submittal of recommendations to the Secretary of the Interior. If it is determined that there may be surface impacts resulting from proposed mining on the proposed lease tracts, then as per 30 CFR 740.40(c)(2) & (3), the OSM will as necessary consult with the BLM and the USACE, the land management agency, and require the proposed mining plans be revised to resolve any issues and concerns.

The WVDNR manages the East Lynn Lake WMA (figure 1.1-4). As a Cooperating Agency, the WVDNR participated in internal scoping, alternative analysis, impact analysis and technical review. The WVDNR provided information, data, and comments to the BLM regarding those elements in which WVDNR has special expertise, or for which the BLM requested information and comment. Throughout the NEPA process, the WVDNR provided independent comment and recommendations, which the BLM incorporated into the FLUA/FEIS where possible.

1.7 ISSUES IDENTIFIED DURING THE SCOPING PROCESS

The BLM held four public and agency meetings, in November 2006, and a public socioeconomic workshop, held in March 2007. Details of these meetings and the publicity in advance are described in Public Involvement—Scoping (section 1.5.3).

Table 1.7-1 lists the issues identified during the East Lynn Lake Coal Lease LUA/EIS scoping meetings held in November 2006. The issues are categorized by resource or LUA/EIS section where they are addressed.

Table 1.7-1
Summary of Issues Identified During Scoping

Issue	LUA/EIS Section
Employment	**Socioeconomics**
Short- and long-term (including post-mining) economic impacts on a local and regional Scale	
Impacts to local businesses	
Impacts to government services	
Tax revenue	
Revenue specifics upon sale of reserves	
Economic and employment aspects related to the extension of Applicants' infrastructure and operations	
Cumulative effects related to other future socioeconomic contributions	
Economic feasibility of accessing all proposed lease areas from existing facilities	
Cost of mineral rights paid by USACE	
Impacts to gas wells	
Groundwater and surface water quality and quantity	**Water Resources**
Flood control	
Drinking water supply (for example, wells)	
Acid mine drainage	
Seeps and springs	
Documentation and citizen education	
Hydrologic balance issues associated with underground mining	
Long-term adequacy of mine barriers/seals	
Mining buffers for streams	
Feeder stream quality	
Contour barriers– limited existing knowledge related to effects of mass wasting at reservoir shorelines	
Post-mining impacts of water seepage	
Conflicts with existing and future uses (such as the USACE East Lynn Lake Project)	**Land Use**
Potential for combustion due to the combination of underground mining and	
Future mining actions which directly or indirectly result from the proposed underground mining	
Impacts to cemeteries	**Cultural**
Short- and long-term impacts for all resources (both on and off site)	**Cumulative Effects**
Integrity of the Cabwaylingo State Forest and the forests of the East Lynn Lake Wildlife Management Area	
Future mining actions which directly or indirectly result from the proposed underground mining	
Mine-life extension	
Short- and long-term impacts for all resources (both on and off site)	

Issue	LUA/EIS Section
Gas wells Physical feasibility of accessing all proposed lease areas from existing facilities Potential for and documentation of subsidence Local education related to blasting Long-term adequacy of mine barriers/seals	**Geologic and Mineral Resources**
Integrity of the Cabwaylingo State Forest and the forests of the East Lynn Lake Wildlife Management Area Surface soil moisture impacts Impacts to overall ecosystem in the area	**Vegetation**
Updates to mine permit renewal application maps Condition enforcement	**Monitoring**
Surface water quality Surface disturbance Impacts to the development potential for future recreation	**Recreation**
Impacts to rare terrestrial species	**Wildlife**
Refuse storage locations	**Hazardous Materials and Wastes**
Impacts to aesthetic value of the local viewshed	**Visual Resources**
Volume Revenue Coal recoverability maximization	**Coal Recoverability**
Subsidence	**Wetlands**
Underground mine collapse Underground mine fires and explosions Volume of slurry impoundments Inclusion in East Lynn Lake Coal Lease LUA/EIS of a description of 100-percent mining and related concerns	**Health and Safety**
Construction of "minimal" disturbance activities (for example, vent shafts) Will the East Lynn Lake Coal Lease LUA/EIS cover all potential alternatives, including the selection of other, non-adjacent companies?	**Alternatives**
Inclusion of information identified in 30 CFR 740.13(b)(iii)	**Permitting**

As part of the NEPA process, a public socioeconomic workshop was held in Wayne County on March 27, 2007. Several specific management issues and concerns were raised during this workshop. Twenty-six participants in the workshop (16 from the public, including Wayne County commissioners; 10 from the Cooperating Agencies) discussed potential impacts associated with the proposed lease and underground mining of coal. Concerns about the impact on recreational activities such as fishing at East Lynn Lake, which received 531,157 visitors in 2006 (Davis 2007), were voiced. The desire for social and economic

prosperity to be realized in Wayne County as a result of the proposed lease and mining was also expressed. These issues are addressed in the following sections of this document and in the socioeconomic baseline assessment and impact analysis (BLM 2008).

1.8 DOCUMENTS INCORPORATED BY REFERENCE

In an effort to decrease redundancy to other documents and the size of this Final LUA/Final EIS (FLUA/FEIS), some material incorporates other materials by reference. Material specifically cited or otherwise used in the preparation of this FLUA/FEIS is hereby incorporated by reference.

The *Federal Coal Lease Amendments Act* (FCLAA) requires that lands considered for leasing be included in a comprehensive land use plan and that leasing decisions be compatible with that plan. The BLM does not have surface management responsibilities in West Virginia, so no land use management plan exists for this area. This document is a land use analysis that studies all land use plans for the area to assure conformance with the plans of other agencies.

The following documents contain background information, resource data, objectives and decisions relevant to this FLUA/FEIS and information in these documents is hereby incorporated by reference. Where operational or management plans are in place, this LUA/EIS is in conformance with these documents.

- *Final Environmental Impact Statement, East Lynn Lake, Twelvepole Creek, West Virginia* (USACE 1974b)

  The FEIS is a 50-page document describing the impacts of the flood control effort that the USACE pursued in the 1970s. Another 50 pages present the comments of other agencies and the USACE responses, followed by 70 pages of attachments and appendices that include itemized data as referred to in the text.

  In section 2, Environmental Setting, valuable data regarding the condition of the following resources at the time (1974) are incorporated by reference to this document: geology, earthquake history, mineral resources, ground water, soil, climate, runoff characteristics, floods, water quality, fish, aquatic invertebrates, amphibians and reptiles, vegetation, mammals, birds, game animals, historical (cultural), and socio-economic resources (pages 8-26, and applicable appendices).

  Section 3e. describes the impacts to the mineral resource. The USACE acquired the mineral rights, except for oil and gas. At the time gas was a significant part of the local economy and oil was not thought to be available in commercial amounts. No coal was mined at the time, but Columbia Gas had expressed an interest in coal gasification. The FEIS states the rationale for the acquisition of the mineral rights to the coal as giving the USACE a "degree of control of adverse environmental effects of coal extraction on lands immediately adjacent to the lake," given that "the eventual extraction of this coal is probable."

- *East Lynn Lake Wildlife Management Area Forest Management Plan* (Dotson 1992)

  A seven-page document with nine appendices, the *Forest Management Plan* includes data current as of 1992 regarding: topography, climate and soils, forest, wildlife, critical and unique habitat, rare and endangered plants and animals, and historical and archaeological sites (pages 1-3 and appendices B, C, and D).

- *West Virginia Statewide Comprehensive Outdoor Recreation Plan* (WVDO 2003)

  The WVSCORP provides background data for: population and economy (pages 22-27); recreational supply and demand (pages 38-50); as well as current plans for developing recreational areas and tourism in West Virginia (pages 52-64). This EIS is in conformance with the SCORP policies and actions.

- *Land Use Master Plan, Wayne County, West Virginia* (Wayne County 2004)

  This document is part of the MOU between the WVDNR and the USACE. It reports on plans for the FY 2008-2009 for the management of: roads and waste materials; soil erosion prevention; fire prevention; supervising, patrolling and policing the licensed areas, including water areas; cultural resources; and maintenance plans (pages 2-7) . This EIS is in conformance with this document.

- *Operational Management Plan, East Lynn Lake* (USACE 2006a)

  The USACE *Operational Management Plan* provides current statistics on the East Lynn Lake Project, dam and reservoir, and recreational facilities. The two part document is divided into multiple sections: Part 1 covers natural resource management, including the Fish Wildlife and Forest Management Plan (pages 6-7); pest control; visual or aesthetic qualities of project lands; erosion control; water quality protection; fish and aquatic life management; wildfire prevention, readiness and suppression; and oil, gas and coal reserves (pages 8-15). Part 2 covers park management, including hazardous spills contingency/action plans (exhibit 2-G), safety (pages 2-1 to 2-12) and visitor assistance (pages 3-1 to 3-22). This EIS is in conformance with this document.

- *East Lynn Lake Wildlife Management Area; Advanced Management Plan, FY2008-2009* (WVDNR 2008).

  This document is part of the MOU between the WVDNR and the USACE. It reports on plans for the FY 2008-2009 for the management of: roads and waste materials; soil erosion prevention; fire prevention; supervising, patrolling and policing the licensed areas, including water areas; cultural resources; and maintenance plans (pages 2-7) . The license for the WVDNR to manage the WMA was renewed in January, 2009 and is in effect until 2033 (USACE 2009). This EIS is in conformance with this document.

These documents and the entirety of the two LBAs, submitted by Pen Coal Corporation (now Argus) and Rockspring, and supporting records are currently maintained at the BLM Milwaukee Field Office, 626 E. Wisconsin Ave. Suite 200, Milwaukee, Wisconsin 53202.

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CHAPTER 2
ALTERNATIVES INCLUDING THE PROPOSED ACTION

The Proposed Action and associated Reasonably Foreseeable Development Scenario (RFDS), as well as the No Action Alternative and associated No Action Scenario (NAS), are described in the following sections. Alternatives which were evaluated but not carried through the NEPA process, and the reasons for not retaining them, are also described.

2.1 ALTERNATIVES

2.1.1 Proposed Action (Preferred Alternative)

The USACE and the WVDNR manage activities that occur on the land surface at the USACE East Lynn Lake Project. Portions of this land lie over federally-owned coal, managed by the BLM. The Applicants submitted applications to lease federal coal that lies under nine tracts of USACE East Lynn Lake Project land in May, 1999. Rockspring filed a revision to its applications in 2004, and again in 2007. The applications and revisions were submitted in accordance with the lease-by-application (LBA) process contained in 43 CFR 3425.

The nine tracts include approximately 13,093 acres of land and are located next to East Lynn Lake. The nine tracts are also located next to existing, active, permitted underground coal mines that lie under private land. The *Water Resources Development Act of 1999* removed the consent authority from the USACE (the SMA), while the decision-making authority regarding federal coal leasing remained with the BLM.

The Proposed Action is for the BLM to respond to these applications by offering the federal coal for competitive leasing. If the Proposed Action is selected, the federal coal that lies under the lease tracts would be leased for mining. The RFDS associated with that Proposed Action is described below (BLM 2009; appendix B). The analysis is expected to predict a low probability of limited surface impacts associated with:

- surface subsidence and subsequent reclamation,
- groundwater impacts that could affect surface water, wells, or springs,
- surface disturbance that would result from any necessary emergency rescue operations,
- future need for ventilation shafts,
- exploration drilling, or
- cumulative impacts.

For the purpose of the impact analysis, a maximum of 20 acres of surface disturbance over a 10-year period has been estimated. Any potential disturbance would be widely distributed over the approximately 13,000-acre lease tracts, with very small areas of disturbance of a few acres in any specific location. The need for any site-specific analysis will be determined in the future if any of the potential impacts identified above actually occurs.

Because the coal lying under the nine lease tracts is managed by the BLM, the leases would be offered under the BLM's standard terms and conditions contained on Lease Form 3400-12. In addition, any special coal lease stipulations identified by the BLM, USACE, OSM, and the WVDNR for the protection of natural resources, consistent with applicable laws, regulations, policies and plans, would be included in the leases. The successful bidder(s) would receive leases. Prior to mining, the lessee would need to obtain the appropriate federal and state permits.

The adjacent, existing permitted underground coal mines and associated processing and waste storage facilities will be active regardless of the decisions made concerning this LUA/EIS process. Because the mines are located on private land and/or are already permitted, these facilities would not require NEPA analysis for continued operation. Therefore, the existing mine facilities are not considered "connected actions" as defined under the CEQ *Regulations for Implementing NEPA* (40 CFR 1500). These existing facilities are included in the analysis of cumulative effects in chapter 4.

A mining and reclamation plan for mining operations on the East Lynn Lake LBA tracts would have to be approved before mining operations could be conducted on the tracts, regardless of who acquires the lease. More specific information about some of these mitigation and monitoring measures and their results at the Argus and Rockspring mines are described for the affected resources in chapter 3.

If impacts are identified during the leasing process that are not addressed by the existing required mitigation measures, the BLM can require additional mitigation measures, in the form of stipulations on the new lease, within the limits of its regulatory authority. Additionally, conditions may be added to the mine plan by OSM or to the permit itself by OSM or the state regulatory authority during the permitting and approval process.

2.1.1a Reasonably Foreseeable Development Scenario

Federal actions, such as issuing a lease to mine federal coal, and any associated actions that may impact environmental and socioeconomic resources must be evaluated. If the Proposed Action is approved, the BLM would hold a competitive leasing process, and the winning bidder(s) would receive leases to mine the federal coal. The proposed coal mining may impact environmental and socioeconomic resources. This FLUA/FEIS analyzes the potential impacts of mining the federal coal. In order to assess potential impacts, a generic mining plan, or "reasonably foreseeable development scenario" (RFDS) must be defined. The BLM developed the RFDS to describe the proposed coal mining activities that can reasonably be expected to occur associated with the proposed lease tracts. The RFDS, included in this document as appendix B, is summarized in the following paragraphs.

The proposed mining would involve only "primary" or "first" mining methods (figures 2.1-1 and 2.1-2), where approximately 50 percent of the coal would be removed. No secondary mining would occur. Continuous mining machines (*see* photograph C-7 in appendix C), conveyor systems (*see* photograph C-9 in appendix C), and preparation plants would be used to mine, transport and process the coal. The coal would be transported on existing conveyors to existing, permitted processing facilities. Waste would be transported and stored in existing, permitted facilities. The processed coal would be transported using rail cars on existing rail lines and trucks on existing roads.

Approximately 41 million in-place tons of coal lie under the proposed Rockspring lease tracts. Rockspring would process that coal to obtain about 11 million tons of marketable, "clean recoverable" coal. Approximately 35 million in-place tons of coal lie under the Argus lease tracts, and Argus would process that coal to obtain about 15 million tons of clean recoverable coal. The disparity in recovery factors is due to the relative fragmentation of the Rockspring holding's mining units, resulting in more inaccessible coal. Approximately 53 million tons of waste rock would be disposed of in existing permitted facilities located on private land. The Applicants operate underground room-and-pillar mines using existing facilities, equipment, and a 500- to 600-person work force of employees and contractors on private lands next to the proposed federal lease tracts. Both Applicants propose to mine the federal coal using the same room-and-pillar mining methods they currently use under adjoining private lands.

The coal seam proposed to be mined is the Coalburg/Winifrede seam. This seam is about 72 inches thick. Rock that lies over coal is known as "cover" or "overburden." The overburden on the proposed lease tracts ranges from zero feet at the surface, where the coal outcrops, to a thickness of about 300 feet. The overburden consists of layers or "beds" of sandstone and shale, including one to three thick, massive sandstone layers. These factors indicate surface subsidence would be unlikely. Sometimes when coal is mined, the overburden can collapse, or subside. When coal is mined using primary room-and-pillar methods, subsidence is usually very limited.

Protective barriers of coal would be maintained in sensitive areas. A 200-ft protective barrier would be maintained around the lake, based on U.S. Bureau of Mines (USBM) guidance provided in USBM Information Circular 8741 (Babcock and Hooker 1977). A 150-ft barrier would be maintained at coal outcrops. Other surface structures, including buildings, cemeteries, and streams, also would be avoided. The East Lynn Lake dam is 1,585 feet from the closest point on the proposed lease tracts, and actual mining activities would be even farther away to avoid USACE structures located near the dam (figure 3.1-17). No mining would be performed in areas where the overburden is equal to or less than 100 feet thick. The buffers and avoidance areas would be based on existing state and federal regulations and guidance from the U.S. Mine Safety and Health Administration (MSHA) and the USBM Information Circular 8741 (Babcock and Hooker 1977).

Gas wells would be avoided by establishing a proposed buffer of roughly 200 feet radius, though different agencies have different requirements. However, for each gas well, establishing a 200-ft buffer would render inaccessible approximately 7,800 tons of coal. More than 140 oil and gas wells are located on the proposed lease tracts, and additional oil and gas wells are proposed. The RFDS for oil and gas well development, an attachment to the coal mining RFDS, is provided in appendix B.

The WVDNR would continue to manage the surface for timber, recreation and wildlife. If the demand is sufficient and resources are available to harvest forest products, the USACE and WVDNR could offer the timber for sale.

Groundwater occurs in both the unconsolidated alluvial materials and consolidated bedrock in the vicinity of the proposed lease tracts. These unconsolidated aquifers are associated with several small stream channels.

Acid mine drainage (AMD) is the discharge of water from a mine that has high acidity, or low pH. The acidity is caused by the presence of pyritic sulfur. As stated in the RFDS (BLM 2009; appendix B), the

Coalburg/Winifrede coal seam contains a total sulfuric content of about 0.56 percent within the proposed lease area. Pyritic sulfur content for the Coalburg/Winifrede seam shows an overall weighted average of 0.05 percent, which is the limit of detection. In mining of the private coal adjacent to the federal lands, alkaline waters have been measured. Appendix G presents an analysis of the potential for AMD generation if the Proposed Action is approved and the RFDS is implemented.

If the Proposed Action is approved, and if the Applicants win the competitive bidding process for the federal coal leases, they would use the existing facilities and personnel to mine the federal coal lying under the proposed lease tracts. No need for additional facilities or personnel is expected. If the Proposed Action is selected, and if the Applicants win the competitive bidding process, mining of the federal coal would effectively extend the life of Rockspring's Camp Creek Mine by about 10 years, and Argus's currently inactive No. 3 Mine and currently active No. 8 Mine life by about 15 years (BLM 2009).

The current royalty rate for federal coal is 8 percent of the coal sales, which would generate approximately $90.4 million in royalties. Of that amount, 75 percent would be transferred to the State of West Virginia according to federal law. According to state statute, the state would then distribute 50 percent of its receipts to the county road commission and 50 percent to the county board of education (Rollyson 2008). The Wayne County Board of Education and the Wayne County Roads Department would each receive about $33.9 million over a period of about 15 years.

Mineable coal reserves are being depleted in the vicinity of the proposed lease tracts (Saunders 2008). Selection of the Proposed Action and implementation of the RFDS is unlikely to result in, or provide access to, other new, reasonably foreseeable mining on private lands.

2.1.1b Hazardous and Solid Waste

Under the Proposed Action the procedures and requirements for handling of hazardous and solid wastes would be the same as the procedures and requirements for the existing mining operations. Solid waste that is produced at the existing Applicant mines consists of floor sweepings, shop rags, lubricant containers, welding rod ends, metal shavings, worn tires, packing material, used filters, and office and food wastes. Current practices would not change if the Applicants acquire the LBA tracts.

The Applicants have reviewed the EPA's Consolidated List of Chemicals Subject to Reporting Under Title III of the *Superfund Amendments and Re-authorization Act* (SARA) of 1986 (as amended) and USEPA's List of Extremely Hazardous Substances as defined in 40 CFR 355 (as amended) for hazardous substances used at the their current operating mines. Each Applicant maintains files containing Material Safety Data Sheets for all chemicals, compounds, and/or substances that are or would be used during the course of mining.

The Applicants are responsible for ensuring that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials as a result of mining are in accordance with all applicable existing or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. All mining activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials are and would continue to be conducted so as to minimize potential environmental impacts.

As part of the permits currently in force, the Applicants must comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR 117, is reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), as amended. The materials for which such notification must be given are the extremely hazardous substances listed in Section 302 of the Emergency Planning and Community Right to Know Act and the hazardous substances designated under Section 102 of CERCLA, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, immediate notice must be given to the WVDEP Division of Water and Waste Management and all other appropriate federal and state agencies.

2.1.1c Regulatory Compliance, Mitigation and Monitoring

SMCRA, along with other federal laws and West Virginia state law require coal mines to collect extensive baseline information and implement extensive monitoring programs and mitigation measures. The currently approved mine permits for Rockspring and Argus include these requirements. Monitoring programs and mitigation measures that are required by regulation are considered to be part of the Proposed Action for the East Lynn Lake LBA Tracts. These data collection requirements, mitigation plans, and monitoring commitments would be extended to include mining operations on the East Lynn Lake LBA tracts, if leased, and permitted for mining by the appropriate agencies. A mining and reclamation plan for mining operations on the East Lynn Lake LBA tracts would have to be approved before mining operations could be conducted on the tracts, regardless of who acquires it. The major mitigation and monitoring measures that are required by state or federal regulation are summarized in table 2.1-1. More specific information about some of these mitigation and monitoring measures and their results at the Argus and Rockspring Mine are described in Chapter 3.

If impacts are identified during the leasing process that are not addressed by the existing required mitigation measures, the BLM can require additional mitigation measures, in the form of stipulations on the new lease, within the limits of its regulatory authority. Additionally, conditions may be added to the mine plan by OSM or to the permit itself by OSM or the State Regulatory authority during permitting and approval processes.

2.1.2 No Action Alternative

The No Action Alternative is to deny the Applicants' pending LBAs to lease the federal coal. The associated activities on the proposed lease tracts are described as the NAS. Under the NAS, the resources on and under the proposed lease tracts would be managed in the same way they are managed now. The USACE would continue to manage activities on the surface of the proposed lease tracts for flood control, recreation, and fisheries. The WVDNR would continue to manage the surface for timber, recreation and wildlife. If the demand is sufficient and resources are available to harvest forest products, the USACE and WVDNR could offer the timber for sale. The federal coal would remain in-place and not be mined. The owners of the oil and gas estate would continue to produce from existing wells and continue to drill additional wells to increase production. The opportunity would exist to lease and mine the coal in the future, although physical and legal access to the coal would probably be limited as a result of the

continued mining of the private coal at the existing mining operations. The existing operating mines would continue to mine private coal using their existing facilities.

Under the NAS, it is assumed that continued oil and gas drilling would open up additional avenues of access into the USACE East Lynn Lake Project lands. This increased access could lead to additional timber harvesting and unauthorized ORV use.

2.2 COMPARISON OF ALTERNATIVES

The direction, decisions and guidance contained in the existing plans mentioned in section 1.5 are common to both the Proposed Action and No Action Alternative. Both alternatives assume on-going activities on the surface of the proposed lease tracts, namely continued oil and gas development and increased recreational use of the USACE East Lynn Lake Project area including legal and illegal ORV use, and hiking. Some interaction may occur between the potential coal development described in the RFDS and the gas development described in the attachment to the RFDS (both provided in appendix B), depending on which occurs first and how the coal and oil and gas activities are coordinated. Environmental impacts associated with these activities and other past, present, and reasonably foreseeable future actions are analyzed in the Cumulative Effects section (4.0) of this document.

Impacts of the Proposed Action and the No Action Alternative are compared on table 2.2-1. For most environmental resources the Proposed Action, which would extend the life of the adjacent private mines for 10-15 years, will continue the current impacts, not add new ones. Voluntary and required protective measures are proposed to minimize potential environmental impacts. Voluntary measures include barriers, leaving the coal in place under the lake, and minimal mining under perennial streams. Required measures include state and federal permitting processes (OSM, WVDEP), state and federal monitoring plans (see table 2.1-1), and any stipulations resulting from this NEPA process.

Implementation of the Proposed Action and associated RFDS (provided in appendix B) is expected to provide positive social and economic benefits. These positive benefits include extending jobs, a continued tax base, severance taxes and royalties returned to the local economy, and providing a stable social environment. Limited and temporary impacts to land tenure are expected under the Proposed Action as well.

Implementation of the No Action Alternative and the NAS would continue the baseline conditions for most resources, except for air and socioeconomics. Air resources would improve slightly if the mine processing operations were to close, due to reduced unpaved road traffic. Negative socioeconomic impacts would include loss of roughly 500-600 jobs; loss of direct, indirect and induced economic benefits; loss of severance tax and federal royalty revenues; loss of tax base for schools and social services; and a decline in demand for housing along with possible diminished property values.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Alternatives to the proposed action are usually developed when another reasonable or practicable approach would:

- achieve the purpose and need,
- more thoroughly address an issue or minimize an impact, or
- provide possible beneficial mitigation measures.

The BLM considered available information in identifying alternatives. Based on the available information, the mineral and geologic resources, and water resources are the resources of concern, if the Proposed Action were to be selected, and proposed mining were to be performed. To gain some insight on the extent of those potential impacts, mineral and geology specialists prepared a preliminary subsidence analysis (PSA) (BLM 2007d) based on the mining plan described in the RFDS and using available data and information. The specialists concluded that the probability of the occurrence of subsidence under the RFDS would be very low, and if subsidence were to occur, very limited surface effects would be observed, and/or very limited impact to surface water and groundwater would occur (BLM 2007d). Conclusions of the PSA (BLM 2007d) are summarized in Appendix E.

The BLM considered the conclusions of the PSA and MSHA regulations in identifying other possible alternatives. Several alternatives were considered but have been eliminated from further analysis. These alternatives and their respective reasons for exclusion are described below.

2.3.1 Different Recovery Rate or Mining Method Alternative

The BLM considered several different recovery rate and mining method alternatives. Maximum coal recovery would require either increased recovery rates using secondary room-and-pillar mining, longwall mining, or surface mining. Secondary room-and-pillar mining could be achieved by leaving smaller pillars or removing some pillars, both of which increase safety hazards and increase the likelihood of subsidence. As a result, this alternative would not meet the purpose of emphasizing health and safety or of minimizing environmental impacts. Similarly, longwall mining would remove large segments of coal, resulting in high levels of surface subsidence and would not meet the purpose of minimizing environmental impacts. A reduced recovery rate (less than 50 percent) would not be feasible economically, and as a result would not meet the purpose and need.

Surface mining is only practical in limited areas on the proposed lease tracts due to the terrain and depth of the coal seam. Surface mining would cause surface impacts and would not meet the Proposed Action's purpose of minimizing environmental impacts.

2.3.2 Non-adjacent Access to Proposed Lease Tracts Alternative

The Proposed Action applies to the pending LBAs from two companies with adjacent mining operations. If the decision is to proceed with the leasing, the BLM would begin an open and competitive leasing process. No other company has indicated an interest to date and it is not likely that other companies could effectively mine the coal that lies under the proposed lease tracts due to limited access and the need to

analyze, permit and construct new facilities. This alternative would not meet the purpose of optimizing economic benefits or minimizing environmental impacts.

2.3.3 Inclusion of Application for Exploratory Drilling Alternative

In late 2006, Rockspring proposed submitting an application to the BLM to perform exploratory drilling on one of the federal lease tracts. The BLM considered whether exploratory drilling on federal lease tracts being proposed by Rockspring should be incorporated into the on-going East Lynn Lake Coal Lease LUA/EIS process, or whether to process the application for exploratory drilling at a later date. Discussions among the BLM and Rockspring regarding the submittal of this application continued during and after the March 27, 2007 alternatives meeting. In May 2007, the BLM decided that Rockspring's application for exploratory drilling would be processed separately after the FLUA/FEIS. The potential for additional coal exploration is analyzed in Cumulative Effects (section 4.0).

2.3.4 Reduced Acreage, Modified Buffer, and Minor Surface Disturbance Alternative

The BLM and the cooperating agencies extensively discussed an alternative that would:

- modify the lake and dam buffers and
- reduce the acreage to be leased

The proposed 200-ft buffer from the lake and the dam is based on the 1977 USBM Information Circular 8741 (Babcock and Hooker 1977). This circular represents the best available science and engineering practice to date. The 200-ft buffer is measured from 701 feet above mean sea level (amsl) which is the spillway elevation of the lake and thus will be further, in practice, from the normal operating pool of East Lynn Lake. The requirement to maintain a minimum of 100 feet of overburden will also push the buffer beyond 200 feet in many areas.

As far as protecting the dam, the boundary of the lease tract adjacent to the dam is 1,585 feet from the dam which is far greater than the 200-ft buffer proposed by the circular. Based on this information and the fact that there is no available science that supports the need for a buffer in excess of the 200 feet, the BLM eliminated this alternative from detailed analysis.

2.3.5 Coordinated Oil and Gas Development and Mining Alternative

In February 2007, Chesapeake Energy Corporation (CEC) submitted a Notice and Application for a Well Work Permit for two wells on Rockspring's proposed lease tract F to the West Virginia Oil and Gas Commission. Currently, CEC proposes to install four natural gas wells on the proposed lease tracts. In June 2007, responding to this proposal the BLM considered developing an alternative that involved CEC in the process. The BLM approached CEC to discuss its activities on the proposed lease tracts and consider incorporation of these activities into the Proposed Action and RFDS. In response, the BLM has prepared an attachment to the RFDS (BLM 2007b; provided in appendix B as attachment 1) which addresses the private oil and gas development.

2.3.6 Adaptive Management Alternative

Adaptive management is the concept that adjustments are made to improve effectiveness and reduce impacts, as the decisions and actions are implemented, and additional information is gained based on continuous monitoring. This approach is especially useful where there is uncertainty about impacts, either due to lack of knowledge, changing technology, or changing conditions. This concept can be incorporated in the monitoring section of the LUA/EIS as mitigation measures in the impacts analysis and in the ROD along with specifying the kinds of monitoring that would be required to track any potential impacts. As a result, an alternative presenting this approach is not necessary.

2.4 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

2.4.1 Past Actions

Previous activities that have occurred in the vicinity of the proposed lease tracts include:

- historical coal mining,
- human occupancy (of which remnants have been mostly removed),
- timber harvest, both legal and illegal,
- gas well development,
- utilities (electric, phone, water, gas, communication, etc.),
- agricultural use,
- road and highway construction,
- establishment of the private cemeteries,
- construction of the dam, spillway, and outlet works,
- construction of recreation and other USACE project facilities,
- ORV use, both authorized and unauthorized, and
- hunting and fishing.

2.4.2 Present Actions

Activities currently within the vicinity of the proposed lease tracts include:

- nearby coal mining operations,
- gas well operation and maintenance,
- utilities (electric, phone, water, gas, communication, etc.) operation and maintenance,
- road, railroad, and highway maintenance,
- use of the private cemeteries,
- operation and maintenance of the dam, recreation facilities, and the USACE East Lynn Lake Project facilities,

- ORV use, both authorized and unauthorized,
- hunting and fishing, and
- illegal timber harvest.

2.4.3 Proposed and Reasonably Foreseeable Future Actions

Activities that are either proposed or reasonably foreseeable within the vicinity of the proposed lease tracts include:

- local, regional and national population increase and associated residential, commercial, and infrastructure development based on population projections,
- future additional coal exploration drilling,
- additional recreation facility development on the USACE East Lynn Lake Project by USACE or WVDNR, or on nearby private lands,
- increased recreational use of the USACE East Lynn Lake Project area and at existing facilities associated with the lake,
- drilling of 12 to 20 additional gas wells within the proposed lease tracts by the owners of the oil and gas estate (based on the attachment to the RFDS),
- more rights-of-way for utilities and transportation, including those associated with additional gas wells,
- increased ORV use, both legal and illegal, due to increased access,
- increased timber harvest, both legal and illegal, due to increased access, and
- timber harvest as provided in the USACE and WVDNR plans.

CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 GEOLOGY AND MINERAL RESOURCES

3.1.1 Affected Environment

The geology and mineral resources study area is the area within the proposed lease tracts (figure 3.1-1). Text in this subsection summarizes available information on the geology, structural features, mineral resources, and geologic hazards in the study area and its surroundings, as well as the mining and oil and gas development activities associated with these resources.

3.1.1a Geology and Mineral Resources

The study area is located in the Appalachian Plateau, which is composed of deeply eroded hills and valleys with slopes that range from 30 to 40 percent. The geological map produced by the West Virginia Geological and Economic Survey (WVGES 1969) shows that the land slopes to the northwest. A sandstone layer is present on the high ridge tops. Surficial deposits of quaternary alluvium and colluvium are found in the stream valleys, and these deposits are composed mainly of sand and gravel with minor amounts of silt and clay.

Various terms are used to describe the geology of an area. The different layers of rock are known as stratigraphic units. The type and order of these stratigraphic units may vary with depth. When geologists find an area with similar stratigraphic units in a similar order, they call that group of units a formation. For this study, the proposed federal coal resource is located within geologic formations less than 1,000 feet below ground surface (bgs), or in shallow geologic formations. Oil and natural gas resources are located in geologic formations 1,000 feet or more bgs, or in deep geologic formations.

Shallow Geology–The stratigraphic units reported within this study area are Pennsylvanian in age and belong to the Glenshaw, the Allegheny, and the Kanawha Formations (figures 3.1-2 and 3.1-3).

The Glenshaw Formation, part of the Conemaugh Group, was formed in a marine environment. Members of the Glenshaw Formation identified in central Wayne County (Martino 1996) include the Pittsburg Red Shale, Cambridge Limestone, Upper and Lower Brush Creek Limestone, Brush Creek Coal and the Mahoning Sandstone. Although the Upper Glenshaw Formation includes the Pittsburgh Red Shale member, only the base of the Mahoning Sandstone member of the Glenshaw Formation is present on high ridge tops in the geologic study area (P&A 1999). The Mahoning Sandstone consists of thick, cliff forming sandstone with compound cross-stratification.

The Allegheny and the Kanawha Formations were formed in a deltaic environment. From the top to the bottom of the Allegheny Formation, the stratigraphic members include the Upper and Lower Freeport coal seam, the East Lynn Sandstone, and the No. 5 Block coal seam. The Upper and Lower Freeport seams are very thin or pinch out, and are not typically mined in the study area.

From the top to the bottom of the Kanawha Formation, the stratigraphic members include the Homewood Sandstone, the Stockton coal seam, the Upper Coalburg Sandstone and the Coalburg/Winifrede coal seam. The Stockton coal seam is not considered to be commercially mineable because it is poorly developed and occurs sporadically within the study area.

In the vicinity of the proposed lease tracts, the No. 5 Block seam and the Coalburg/Winifrede seams are currently being mined. The stratigraphic column (figure 3.1-3) shows these two units in relation to other stratigraphic units in the study area. These two units, along with the sandstone units that lie over them, are described below.

The East Lynn Sandstone is coarse grained, massive, gray, and contains quartz pebbles. The sandstone exhibits channel characteristics, which extend downward to the upper beds of the No. 5 Block coal seam. The sandstone forms massive cliffs and has a thickness that ranges from 50 to 150 feet. The East Lynn Sandstone is a prominent member of the Allegheny Formation in the permit area.

The No. 5 Block coal seam can split into 5 separate (mappable) coal beds or benches. The coal benches range in thickness from 0.65 to 8.7 feet and are separated by sandy shales, silty shales, and fireclays. These shales and fireclays may also exist above or below the coal benches. The No. 5 block coal seam has been mined in the past.

The Upper Coalburg Sandstone lies below the Homewood Sandstone in areas where the Stockton coal seam is not present. This stratigraphic unit is massive, coarse-grained, gray in color and is approximately 55 feet thick. Shales and fireclays may exist above or below this stratigraphic unit. The roof material for the Coalburg/Winifrede coal seam consists of this competent, massive, stratigraphic unit.

The Coalburg/Winifrede coal seam lies approximately 108 feet below the No. 5 Block coal seam (P&A 1999), under approximately 55 feet of sandstone. Overall thickness of the stratigraphic units above the coal seam up to the surface (known as the overburden) ranges from zero to 750 feet and is less than 100 feet along East Lynn Lake and major drainages. The coal seam has six coal benches that are separated by bone or shale partings. The Coalburg/Winifrede seam follows a northwest direction (trends to the northwest) and has a dip that ranges between 0.3 to 1.8 percent. Structural elevations range from 380 to 700 feet. Both Applicants are currently mining this coal seam.

As noted in the RFDS (BLM 2009; *see* appendix B):

> ...thin underclays usually lie under the Coalburg/Winifrede seam. These clays are largely composed of illite, kaolinite, and silica dust derived from the erosion of quartzose sand. The expandable lattice of the clay minerals allows swelling of these units as moisture is introduced, and these units tend to form relatively impermeable boundaries to the vertical migration of groundwater.

Deep Geology–Devonian shales, consisting of gray shales and siltstones, and Rochester shale can be found at depths of 1,000 to 4,000 feet below ground surface (bgs) in Wayne County. These shales, which can be gas-bearing units, lie over Silurian period and older rock formations, including the Keefer sandstone formation and the Oriskany Formation. Brown or black, highly organic shale is found between the gray shale and siltstones. Deeper formations containing oil and natural gas reserves have been found at depths of 11,000 feet (Ryder and others 2005). Sandstones, limestones and shales lie under the USACE East Lynn Lake Project.

3.1.1a1 Structural Features

In addition to identifying and describing stratigraphic units, geologists also identify larger geologic features which define the structure of the subsurface, such as folds and fractures in the rock. Indications of this subsurface structure include slumps and linear features, such as photolineaments.

The Doane anticline and the Queens Ridge syncline are located within the geologic study area (figure 3.1-5) and trend from southwest to northeast. Marshall Miller & Associates (MM&A) conducted a geologic evaluation of an area located near Argus' existing Mine 3 known as "Area 6." The consultants identified an area in the central and northern sections of Area 6 where the dip flattens out to a horizontal undulating plane. The consultants concluded that the undulation is a result of natural differential subsidence/compaction, and is not expected to present significant problems during mining (MM&A 1992).

During the Cambrian Period an interior rift system developed that is called the Rome trough. The Rome trough is a northeast-trending graben that extends from eastern Kentucky along western West Virginia (including Wayne County) and up into southwestern Pennsylvania (Gao and others 2000). The Rome trough only affected the Cambrian sediments during deposition (Ryder and others 2005). The graben is bound by two normal faults that drop the Cambrian sediments into a trough that is bound by basement rocks. These basement faults are called the Kentucky River Fault System on the west side of graben (Greb and others 2005) and the East-Margin Fault (Gao and others 2000).

To the west of the proposed lease area in Elliott County, Kentucky, two Cretaceous age, diamond-barren kimberlites intruded the Paleozoic rocks of the Appalachian Basin (Yoksoulian 2006). No evidence of Kimberlites has been documented in Wayne County, West Virginia (Southworth and others 1992).

A fault is considered to be active if there is evidence of displacement within the last 10,000 years (Holocene period). A fault is considered to be potentially active if there is evidence of displacement within the past 150,000 years (the late Quaternary period).

Several faults have been identified within the study area, including:

- the ***Warfield Fault***, located approximately 30 miles to the south in Mingo County, West Virginia (USGS 2005),
- the ***Pembroke Fault*** (figure 3.1-4), located about 85 miles to the southeast, along the north side of the New River Valley between Pembroke and Pearisburg, Virginia (USGS 2005), and
- normal slip faults, located within the geologic study area (MM&A 1995).

The Warfield Fault is an inactive fault that trends from east to west (MM&A 1995). The Pembroke Fault is a quaternary surface deformation comprised of a set of 5 faults. The faulting occurred approximately 1.5 to 2.0 million years ago, between the early Quaternary and late Pleistocene age (USGS 2005).

Other fractures found in the vicinity of the study area are natural fractures associated with stress relief, which occurs primarily near the surface. Blackburn (1997) documents weathered brown sandstones and shales near the surface throughout the area. Historical erosion and removal of surface rock layers has resulted in unloading. This unloading in turn has led to stress relief within the lower units, which has caused fracturing of the rock in those lower units. Subsequent flow of water through these fractures has caused chemical weathering. The fractures in these stress-relief zones are generally vertical along valley

walls and horizontal under valley floors. Vertical fractures typically extend to 50 to 60 feet bgs (Blackburn 1997), and on one occasion have been reported to extend to roughly 120 feet (P&A 1999). Frequency of fracturing decreases with depth (Blackburn 1997). The stress-relief fracture zone is the most significant aquifer in the vicinity of the study area, and the majority of residents in the area use this source for water supply (MM&A n.d., P&A 2000a).

Localized small scale slumps and other displacements have been encountered in the area surrounding the proposed lease tracts. A geologic investigation was conducted by MM&A (1991, 1992) to identify these geologic conditions and evaluate coal quality and coal potential. These investigations were reviewed to identify the potential for surface displacement or poor roof conditions due to faulting or other seismic activity. During the investigations, several localized small scale slumps, or other displacements were identified. The findings of these investigations are summarized below:

- Small scale slumps or normal slip faults have been reported to disrupt the Coalburg/Winifrede seam. Vertical displacement of up to 5 feet has been identified in the Devilstrace No. 1 Mine. The vertical displacement is reported to be a result of localized differential compaction associated with transitional zones where material changes abruptly from non-compactable sandstones to highly compactable shales and claystones (MM&A 1991). Rockspring has encountered some local slip faults/depositional features where the coal seam has been displaced two to seven feet (Barton 2007a). In these cases, Rockspring has either cut the roof/floor to connect these entries or discontinued advancement. No known surface deformation or damage to structures has been reported as a result of localized displacement (Eggerud 2007).
- Other displacements have been reported to the north of the Devilstrace area and in Area 6. The cause of displacement is reported to possibly be associated with structural uplift or regional differential subsidence, based on previous field observations and reported indications of a pronounced trend direction to the northeast/southwest. Linear features were found in this area (MM&A 1992).
- Soft incompetent roof conditions exist along the Left Fork Creek and Bluewater Branch. Coalescing channel sandstone deposits exist in the Devilstrace area and most of the Bluewater Branch, which is southeast of the proposed lease tracts near proposed lease Areas A and C. This area is subject to slickensides and channel scouring that result in wedge-shaped blocks and weakly cohesive “stack rock.” Leader coals and soft-clayey material are common floor conditions in this area and exhibit potential weakness in bearing capacity. The Coalburg/Winifrede coal seam exhibits extreme splitting and along Kiah Creek and the Left Fork Creek. These areas do not meet regulatory requirements and are considered to be “non-compliance areas” with respect to poor coal quality (MM&A 1992). No known surface deformation or damage to structures has been reported as a result of these structural conditions (Eggerud 2007).

Linear features, or photolineaments, which are indications of subsurface structures, are common within the geologic study area (figure 3.1-5). Figure 3.1-5 also shows other structural features within the geologic study area. These structural features were provided by the Applicants and include published and non-published features identified during field studies.

3.1.1a2 Structural Features–Geologic Hazards

Geologic hazards include subsidence, seismic activity and faults, landslides and surface slumps or failures.

Subsidence–The lowering or sinking of rock below the surrounding ground surface, or subsidence, is a potential geologic hazard. Natural subsidence may occur in areas where limestone is close to the surface and sinkholes, caves and complex underground drainage systems form. However, limestone and this type of topography, known as karst, is not present in the study area (figure 3.1-6). Human activities including underground mining or oil, gas, or water production from deep reservoirs can also cause subsidence. For example, underground longwall mining or room-and-pillar mining with high extraction ratios could cause subsidence. The aspects of mining that can cause subsidence–lack of roof support and horizontal and vertical strains–are described in appendix E, and mining-induced subsidence in the study area is addressed below (*see* Geology and Mineral Resources–Human Development–Surrounding Area–Mining).

The Applicants are actively mining the Coalburg/Winifrede seam in accordance with existing WVDEP-approved permits. When poor roof or floor conditions, such as slickensides, displacement, weak materials or channel scouring have been encountered in existing operations, mining engineers have designed the mine to address potential subsidence and other safety issues or when necessary, have elected to abandon unsafe areas.

Seismic Activity–Seismic activity occurs when movement of the earth's crust generates energy that radiates in all directions, causing an earthquake and potentially causing breaks in the surface known as faults. The direction of movement between sections of earth on either side of the fault can be vertical, horizontal, or both and is referred to as displacement. One side is lifted higher than the other side in vertical displacement.

The study area is located in a region with minimal seismic activity. Earthquake records indicate that the nearest earthquake occurred near McDowell County, West Virginia, approximately 59 miles from the study area, on June 19, 1976. The magnitude was recorded as less than 4.0 on the Richter scale. The largest earthquake reported in the vicinity occurred in Giles County, Virginia, approximately 85 miles from the study area, in 1897, with a magnitude of 5.6 on the Richter scale (USGS 2005). Approximate locations and estimated magnitudes of seismic events are shown on figure 3.1-4. Mining-induced seismic activity is described below (Surrounding Area–Mining–Existing Impacts–Seismic Activity).

Landslides–Landslides are defined as a downward mass movement of surface soil and/or rock. Mass movement can occur in the form of slips, slumps, rock falls, slides, flows, or creep, as shown on figure 3.1-7. Landslides are primarily caused by failure of steep slopes where soil or highly weathered material lies over a more resistant hard rock known as bedrock. Landslides can occur naturally and are more likely after heavy rains or snow melt. Landslides also can be human-induced. Human-induced slope failures are typically caused by:

- overloading the top of the slope, or head, of an old landslide,
- excavating the bottom of the slope, or toe, of an old slide, and/or
- increasing groundwater levels in the vicinity of an old slide.

Although naturally-occurring landslides are very common and numerous in the mountainous areas of West Virginia, few of the locations have been mapped. As a result, landslides within Wayne County or the study area are not well documented (Ashton 2007). No landslides have been documented or mapped within the proposed lease area boundary. In the study area, there is a high probability that a landslide would be caused by natural events. Mining-induced landslide probability is described below (Surrounding Area-Mining-Existing-Impacts-Landslides).

3.1.1b Mineral Resources

Coal, oil and natural gas, and coal bed methane are natural resources typically found in sedimentary rock formations.

3.1.1b1 Coal Reserves

Coal forms over long periods of time, as heat and pressure convert plant remains that have collected in swamps into coal. Coal is ranked by its carbon content: lignite contains the least carbon; bituminous coal contains more carbon; and anthracite contains the most carbon and has the highest energy value as measured in British thermal units (BTU). People have been developing the coal resources in the vicinity of the proposed lease tracts for more than a century. Coal fields in West Virginia are shown on figure 3.1-8. West Virginia has an estimated coal reserve of 33.7 billion tons, of which an estimated 18.4 billion tons is recoverable (OSM 2004). Approximately 92,940,000 short tons of coal were mined in southern West Virginia in 2004 (EIA 2007a). Southwestern West Virginia's Allegheny and Kanawha Formations contain bituminous coal. Both formations are found in the study area and include several coal seams. Two seams are considered to be commercially mineable: the No. 5 Block, and the Coalburg/Winifrede seam.

At the USACE East Lynn Lake Project, John T. Boyd Company conducted a study in 1973 on behalf of Columbia Gas Transmission Corporation (Columbia Gas) to determine the quantity and value of Columbia Gas's coal land that would be adversely affected by the siting of the USACE East Lynn Reservoir. John T. Boyd Company's report on this study is entitled *Coal Land Values, East Lynn Reservoir Area for Columbia Gas Transmission Corporation* (John T. Boyd Company 1973), and is referred to as the "Condemnation Report." The area to be affected is referred to in the Condemnation Report as the "acquisition area." Within the 1973 acquisition area, the Winifrede, No. 5, and Stockton-Lewiston coal seams were considered economically mineable, while numerous other seams were found to be too thin to be of mineable thickness (John T. Boyd Company 1973). The Coalburg/Winifrede reserves typically are low in sulfur, high in BTU, and used principally for clean electric generation (BLM 2009). As part of the condemnation activities associated with the USACE East Lynn Lake Project, coal interests were to be subordinated to the reservoir interests in certain areas. As a result, mining of the No. 5 Block and Stockton-Lewiston seams, which outcrop extensively and would normally be developed by strip or punch mining, were to be prohibited from extraction (John T. Boyd Company 1973).

The acquisition area contained approximately 25,000 acres, whereas Columbia Gas Transmission Corporation's coal lands comprised approximately 16,700 of those 25,000 acres. The boundary of the 1973 acquisition area varies slightly from the current USACE East Lynn Lake Project boundary, and the areas identified within the acquisition area vary somewhat from the current proposed lease tract

boundaries. Information in the Condemnation Report indicates that in 1973 approximately 90 million tons of recoverable coal existed under roughly 23,000 acres within the current USACE East Lynn Lake Project boundary (John T. Boyd Company 1973), as shown in Table 1.3-1.

Based on the most recent available data, approximately 41 million tons of coal lie below the proposed Rockspring lease tracts, and about 11 million tons of that coal is considered to be mineable or "recoverable." Approximately 35 million tons of coal lie below the proposed Argus lease tracts, and about 15 million tons of that coal is considered to be recoverable coal.

3.1.1b2 Oil and Natural Gas Reserves

Estimates of oil and gas reserves in southwestern West Virginia vary widely, and production can range from as low as 10 to 100 million barrels of oil equivalent (MBOE) to as high as 1,000 to 10,000 MBOE, according to the Energy Information Administration (EIA 2007b). In 2005, 230 billion cubic feet (Bcf) of dry natural gas were extracted from West Virginia (EIA 2006). In that same year, 132 acquisitions and 371 extensions of natural gas reserves occurred in West Virginia, according to the *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves 2005 Annual Report* (EIA 2006).

3.1.1b3 Dry Natural Gas

Eleven new dry natural gas fields were discovered in West Virginia in 2005. The proved dry natural gas reserves in West Virginia increased by 1,062 Bcf between the years 2004 to 2005, from 3,397 Bcf to 4,459 Bcf. Such an increase was observed in six other states. This increase, along with the discovery of 11 new fields, suggests an increased level of exploration in the area and an increased level of extraction in the coming years (EIA 2006). No major oil and gas pipeline or liquefied natural gas (LNG) projects are proposed for West Virginia in 2007 (FERC 2007).

The Sidney field in Wayne County is a recognized oil and natural gas field. West Virginia Geological and Economic Survey (WVGES) data collected in 2001 indicate that 2,501 to 6,000 million cubic feet (mmcf) of natural gas were produced in Wayne County (WVGES 2003). At least six different gas-producing zones are known to occur in the vicinity of the proposed lease tracts. These zones include the Big Lime, Big Injun, Squaw, Berea in the Greenbriar, Maccrady, and Price formations, respectively; as well as two or three zones within the Devonian shale. Devonian shales in the region consist of gray shales and siltstones. Brown or black, highly organic shale that contains high quantities of kerogen is found between the gray shale and siltstones. The gray shales and siltstones serve as the reservoir rock and the organic shale serves as the source rock (BLM 2007b). The oil fields in the vicinity of the proposed lease tracts are shown on figure 3.1-9. Natural gas fields in the vicinity of the proposed lease tracts are shown on figure 3.1-10. The majority of the reserves in the vicinity of the proposed lease tracts are gas reserves, in the range of 1,000 to 10,000 mmcf (EIA 2007c), as shown on figure 3.1-10.

3.1.1b4 Coal Bed Methane

Coal bed methane forms within a coal seam. A regional estimate of proved coal bed methane reserves is shown on figure 3.1-11. Limerick (2004) gives a regional estimate of proved coal bed methane reserves that may range from a low of 1-200 Bcf to a high of 500-1,500 Bcf in the vicinity of the proposed lease

tracts. These estimates are shown on figure 3.1-11. Coal bed methane is produced in parts of West Virginia, but there are no wells reported in Wayne County (WVGES 2009).

3.1.1c Human Development

3.1.1c1 Study Area–Mining

Activities–Underground coal mining activity has occurred in West Virginia since the early 1700s. Surface mining began around 1916 and activity increased after World War II. Over time, many of these old mines were abandoned. Currently, approximately 63 percent of West Virginia's coal comes from underground mines, and the remaining 37 percent is produced at surface mines, according to the OSM (OSM 2004).

The OSM defines an abandoned mine as a mine that is covered under the abandoned mine rules, which were established under SMCRA (Waddle 2007). No permits exist for abandoned mines. Abandoned underground mine openings, or drift mine openings, exist on hillsides overlooking the lake and at the heads of many hollows (Conner 1975; USACE 1974b, c). In 1913, WVGES maps showed 73 mine openings within the area now known as the USACE East Lynn Lake Project boundary (USACE 1984). Maps published by the USACE include old abandoned mine locations from as far back as 1927. Unfortunately, no coal seam names or mine depths are shown on these maps.

Where the seam is visible at the surface, it is said to "outcrop" or to be "an outcrop." These outcrops are typically visible on the slopes in the stream valleys, also referred to as drainages or hollows. Historically, many people in West Virginia dug "house mines" with hand tools to obtain coal for heating their homes. These house mine openings are typically narrow, have timbers for roof support, and are believed to be of very limited extent. Local residents likely dug these shallow house mines in the No. 5 Block coal seam, which often outcrops along the main roads in the area, such as Route 37 and contains fewer shale partings than the Coalburg/Winifrede seam. A photograph of typical roadside geology is included in appendix C (photograph C-12). Figure 3.1-18 shows locations where the Coalburg/Winifrede seam outcrops in the area. Because the No. 5 Block was more accessible and more stable, residents could recover almost 95 percent of the No. 5 Block coal, compared to 40 to 50 percent of the coal in the Coalburg/Winifrede seam. The USACE has found several house mines on the USACE East Lynn Lake Project. Other previously mapped mines likely have collapsed and are unrecognizable. The USACE typically fences or closes any identified house mines.

No known abandoned commercial mines have been identified on or within the proposed lease tracts.

Existing Impacts–Any shallow house mines located within the proposed lease tracts are expected to be located in the No. 5 block coal seam, which is located above the Coalburg/Winifrede seam. Any seepage from these mines, which are likely dug in the No. 5 Block seam, is not likely to reach the Coalburg/Winifrede seam roughly 90 to 160 feet below. No impacts to geology and mineral resources have been identified related to abandoned shallow house mines in the area. No commercial abandoned mines are known to exist within the proposed lease tracts.

Trends–The USACE owns the surface of the USACE East Lynn Lake Project, and the USACE's objective is to provide recreation opportunities and flood protection. Therefore, no new unregulated surface activities such as shallow house mining or commercial surface mining are expected to occur on the proposed lease tracts in the future.

3.1.1c2 Study Area–Oil and Gas Development

Activities–Below the USACE East Lynn Lake Project, oil and natural gas resources have been produced from sandstone, limestone and shale reservoirs since before 1930. The oil and gas estate under the East Lynn Lake Project is privately owned. Drilling has occurred in the vicinity of the proposed lease tracts since at least the 1920s. As a result, at least 144 oil and gas wells and associated collection pipelines, at least two compressor stations, and access roads exist on the USACE East Lynn Lake Project (BLM 2009). Available geographic information on the location of these structures was used to develop figure 3.1-10. BLM (2007a) reports that 70 of the 144 wells are plugged and abandoned. The USACE patrols backcountry zones in a strategic manner to ensure all wells are documented and inspected (USACE 2006a).

Existing Impacts–The oil and gas resource under the study area is being extracted for use in energy production. In addition, oil and gas drilling activities may render part of the federal coal reserve inaccessible due to the requirement to leave a protective barrier pillar around existing wells. No other impacts to geology and mineral resources associated with existing oil and gas development activities have been identified. Impacts to other resources, including soil, vegetation, and wildlife, are addressed in sections 3.4 through 3.7.

Trends– Oil and gas development is expected to continue in the future.

3.1.1c3 Study Area–Recreational Activities

Recreational activities including hiking, mountain biking, hunting, and ORV use occur within the study area. A photograph of an area on the USACE East Lynn Lake Project impacted by ORV use is included in appendix C (photograph C-5). While biking and ORV use may contribute to erosion and localized damage to soils, as described in section 3.4 (Soil Resources), no slumping is expected. These recreational activities result in minimal surface disturbance, so the probability of landslide occurrence is low. These recreational activities are expected to continue in the future.

3.1.1c4 Surrounding Area–Mining

Surrounding Area–Mining–Activities– Historically, local residents dug shallow house mines, mainly in the No. 5 Block coal seam, in the vicinity of the proposed lease tracts. Eventually these small house mines were abandoned. No significant impacts are expected from these house mines. Coal companies also have been mining in the area surrounding the study area for more than a century. Over time, these commercial mines have also been abandoned.

Historical abandoned commercial mine openings are larger than house mine openings, are typically 12 to 15 feet wide, and contain pillars that support the roof. The WVDEP Office of Abandoned Mine Lands and Reclamation (WVAMLR) maintains a database of abandoned mine lands (AML) (figure 3.1-12). The database does not indicate the coal seam mined, or the depth of the mine. No AMLs are reported on the study area, and the closest AML is more than a mile away from the study area. Rockspring has obtained archive maps of abandoned commercial mine locations in Wayne County, and compared that information to data from its permitted Camp Creek Mine north of the study area (figure 3.1-13). Rockspring has concluded that the majority of these abandoned commercial mines are located within the No. 5 Block coal seam (Barton 2007b). Argus indicated that no abandoned commercial mines exist on its

permitted areas south of the lake, and that most historical mining in the area was performed in the No. 5 Block seam north of the lake (Maggard 2007b). Both Applicants have extensive operations under the private lands that adjoin the proposed lease tracts. Neither Applicant has encountered undocumented mines (Barton 2007b, Maggard 2007b), suggesting that undocumented mines are unlikely in the study area.

Inactive mines are shown on figure 3.1-12. An inactive mine is one that is under a current permit yet where mining has been suspended, or a mine that is in "temporary cessation." A mine will typically remain in the "inactive" status either to allow for mining activities to resume in the near future, or to complete reclamation efforts. Inactive mines exist in the vicinity of the study area (Barton 2007b, Maggard 2007b).

Active mines are shown on figure 3.1-12. The WVDEP issued 130 permits for underground and surface mining prospecting and other coal mining related activities in Wayne County between 1973 and 2007 (WVDEP 2007). Historically, several companies operated small underground mines north of the proposed lease tracts, mainly in the Camp Creek Mine area. These operators extracted coal from the No. 5 Block coal seam member of the Allegheny Formation. Currently, the Applicants (Argus and Rockspring) operate permitted, underground partial-extraction room-and-pillar mines under lands that lie next to the proposed lease tracts (figure 3.1-1).

North of the lake, Rockspring is mining the Coalburg/Winifrede coal seam member of the Kanawha Formation in the Camp Creek Mine (part of Modification No. 1, Area No. 9) as shown on figure 3.1-1). This facility is located to the north and east of the lake, adjacent to Rockspring's proposed lease tracts A and B. Other mining by Rockspring includes, but is not limited to, the Lincoln and Ben Haley Branch mines (Modification Areas 1 and 2). These mining activities are east of Rockspring's proposed lease tracts C through F. Rockspring currently produces approximately 3 million tons of coal per year (BLM 2009).

South of the lake, Argus is mining the Coalburg/Winifrede coal seam in Mine No. 8 and Mine No. 3 in its Devilstrace mining area. These operations are adjacent to and southeast of Argus's proposed lease tract areas A and C. Argus also operates other facilities, including the permitted Mine No. 3 surface mine, where coal is extracted from the No. 5 Block coal seam member of the Allegheny Formation. Argus's underground operations produce approximately 2 million tons of coal per year (BLM 2009).

The Applicants are performing permitted underground room-and-pillar mining with partial extraction under lands in the vicinity of the study area. Extraction ratios are approximately 50 percent, with no second mining. The Applicants have calculated pillar stresses as part of their normal mine plan in order to determine the stability of the pillars. The Applicants have used cribbing and other control measures to stabilize the roof (*see* photograph, C-8, of roof bolter in appendix C) and floor in weak areas in their existing operations. Pillar sizes have also been modified as needed in these areas to provide stability and minimize the potential for roof or floor failure. Argus uses the well-established Bieniawski method, along with laboratory data on coal strength and the expected extraction ratio (typically 49 percent) to determine the factor of safety against failure (P&A 2000a). Rockspring typically uses the "Analysis of Retreat Mine Pillar Stability" method developed by the National Institute for Occupational Safety and Health to determine the safety factor (Rockspring 2004).

To minimize the potential for sudden releases of water from flooded mine workings, called "blow outs," in existing underground operations, the Applicants maintain outcrop barrier widths between 50 to 150 feet in accordance with state and federal regulations. In addition, after mining is completed, they commonly install wet seals at entries to the inactive mining areas to further minimize the potential for blowouts.

Below structures such as cemeteries and recreational facilities, the Applicants use a "minimum protective zone" as shown on figure 3.1-14. This protective zone is based on the angle of draw, which describes the angle required to reach the point where subsidence becomes negligible and identifies the width of the measurable subsidence. Typical practice for minimizing potential effects to surface structures involves limiting the extraction ratio to 50 percent within this angle of draw (Peng 1992). As a general rule, the Applicants have established protective barriers in nearby mining along perennial stream valleys by leaving coal in-place where the overburden is equal to or less than 100 feet thick. Based on discussions with WVDEP (Eggerud 2007), no known water replacement requests or water quality violations have been written for underground mining of the Coalburg/Winifrede coal seam in the vicinity of the study area. No known complaints regarding water quality or water supply were reported to be a result of underground mining of the Coalburg/Winifrede coal seam. Reports associated with hydrologic effects, such as water supply and water quality, are described in detail in sections 3.2 (Surface Water Resources) and 3.3 (Groundwater Resources).

Mining-related activities in the area surrounding the proposed lease tracts include storing coal waste in coal refuse piles and coal slurry impoundments. These permitted facilities are located on private lands, and are compliant with federal and state regulations. No similar facilities are proposed in the study area. No impacts to geology and mineral resources have been identified.

Surrounding Area–Mining–Existing Impacts–Mining-related subsidence is described in appendix E. Impacts from existing mining activities on the lands surrounding the study area are described below.

Subsidence–As described in appendix E, subsidence can cause vertical movement and horizontal strain. When no coal is left in-place to support the roof of a mine, the roof rock in that mine may move or shift, or "deform," over areas where the coal has been extracted (figure 3.1-15). The vertical and horizontal extent of deformation is dependent on the nature of the roof, the depth from the surface to the mined coal seam (also referred to as the thickness of the overburden), and the extraction ratio.

Deformation of the roof is expressed on the surface as subsidence, which can have negative surface effects in terms of vertical movement and horizontal strains. The area defined by the surface vertical movement is sometimes referred to as the subsidence bowl (figure 3.1-15). The subsidence bowl is defined by planes connecting the edges of the subsidence to the edge of mining. The angle that these planes make to the vertical is known as the angle of draw. The area of the subsidence bowl is always larger than the area of the mined opening. As the depth to the mined seam increases, the vertical extent of subsidence tends to decrease, due to this spreading out effect. Mining engineers typically use an angle of draw of 15 degrees or a more conservative angle of draw of 30 degrees to estimate the subsidence bowl or to establish protective barriers for structures (figure 3.1-14).

Vertical movement accompanying subsidence can cause changes in surface drainage patterns and lead to the development or expansion of flood-prone areas, and can disrupt the flow in surface streams. Horizontal strains accompanying the vertical movement can cause disruption and damage to surface or

near surface structures, including pipelines. Subsidence can also impact subsurface features, including aquifers. Subsidence could disrupt aquifers by causing fractures and changing groundwater flow patterns. Subsidence also could dislocate residential water wells, gas wells, or water or gas pipelines. Impacts to water resources are described in sections 3.2 (Surface Water Resources) and 3.3 (Groundwater Resources).

The Applicants are currently mining the Coalburg/Winifrede seam using underground room-and-pillar mining with partial extraction, or "first mining only" in the surrounding area. General seam thickness, and as a result mining height, in the area is approximately 72 inches, or 6 feet. By maintaining lower extraction ratios (volume of coal mined/in-place volume of coal) mining companies leave sufficient pillars in-place to prevent significant roof collapse, rather than performing second mining with higher extraction ratios where extensive subsidence can result. Figure 3.1-15 compares potential surface effects between low (left side of figure) and high (right side of figure) extraction ratios. In the absence of second mining, the pillars can be sized to adequately support the overburden. The absence of fracture or caving zones at the surface minimizes expression of any subsidence at the surface, or minimizes "the surface effects."

Using extraction ratios of approximately 50 percent also minimizes potential effects to structures. For example, typical industry practice is to limit mining to 50 percent extraction within the angle of draw. The Applicants perform approximately 50 percent extraction throughout their mines, not only within the angle of draw under and around the structures. Using this low extraction ratio throughout the mine further reduces potential effects to structures.

As described in the following paragraphs, this method of first mining only generally minimizes detectable subsidence effects, and in fact very few if any detectable effects of mining-induced subsidence have been reported in the surrounding area. A photograph of existing conditions over active room-and-pillar mining on lands adjoining the proposed lease tracts is included in appendix C (photograph C-10).

A single incident involving a subsidence crack has occurred in the nearby mining areas. The WVDEP completed an inspection report on May 18, 2000 regarding subsidence cracks identified approximately 2,460 feet from the Copley Cemetery, which is located south of the study area, over Argus's Deep Mine No. 3 (P&A various dates) (figure 3.1-16). The investigation was conducted to locate the subsidence cracks and identify the severity of damage. The subsidence cracks were reported to be 2 to 3 feet wide, 2 to 4 feet deep and 100 feet long. WVDEP instructed Pen Coal to reclaim the surface disturbance. According to Argus (Maggard 2007c), this "stress fracture" occurred over an area where approximately 13 to 14 feet of the coal seam was mined–leaving a much taller room than usual. The typical height of mineable coal in the Coalburg/Winifrede seam is 72 inches, or 6 feet. As a result of removing a larger amount of coal than usual, two panels began to sag over time. The surface crack impacted less than one tenth of an acre. Argus reclaimed the area as requested. No surface structural damage was reported as a result of this surface crack (P&A 2000b), so the severity level of this subsidence crack is zero according to the criteria in table 3.1-1. Argus has mined approximately 8,500 acres (Maggard 2007c) and this is the only known surface feature to be reported since Argus began operations in 1988.

Table 3.1-1
Subsidence Damage Classification
North Appalachian Coalfield

Class	Characteristic Basement Damage	Severity Index
I Slight	• Hairline cracks in one or more basement walls and possibly floor slab.	0
	• Some cracks in perimeter walls causing loss of water tightness. • Repointing required in some or all walls.	1
II Moderate	• Cracks in one or more basement walls and floor slab.	1
	• Some wall/footing reconstruction and floor slab replacement required, as well as local repointing.	2
III Severe	• Crack in one or more basement walls and floor slabs.	2
	• Possible wall instability and loss of superstructure support, requiring shoring and bracing. • Extensive repair work involving wall/footing reconstruction and floor slab replacement.	4
IV Very Severe	• Cracks typically in all basement walls, as well as floor slab.	4
	• Possible instability of several walls and loss of superstructure support, requiring extensive shoring and bracing. • Possible significant tilt to home. • General reconstruction of basement walls, footings and floor slab required.	5

Source: Bruhn and others 1983 as shown in Peng 1992

WVDEP considers the compliance history for Rockspring's and Argus's underground mining operations in the Coalburg/Winifrede coal seam near the study area to be above average. In addition, WVDEP is not aware of any significant structural damage reported due to underground mining of the Coalburg/Winifrede coal seam (Eggerud 2007).

Resource specialists noted occasional areas of roof caving at intersections during the October 2006 underground visit to Rockspring's Ben Haley facility. The specialists observed that these areas were localized, and were controlled by cribbing. These localized cave zones likely will extend no more than a few feet upwards and will not contribute to surface subsidence.

Seismicity and Faulting–As described above (*see* Structural Features), localized small scale slumps and other displacements have been encountered in the area surrounding the proposed lease tracts. The Applicants have encountered vertical displacement of up to seven feet resulting from localized differential compaction associated with transitional zones where material changes abruptly, structural uplifting, or regional differential subsidence. No known surface deformation or damage to structures has been reported as a result of localized displacement (Eggerud 2007). Roof failure has not occurred in areas where local slip faults or linear features have been encountered.

Soft incompetent roof conditions, slickensides, and channel scouring exist in the vicinity of the study area. Leader coals and soft-clayey material are common floor conditions in some areas and exhibit potential weakness in bearing capacity. Portions of the Coalburg/Winifrede coal seam exhibit extreme

splitting, and some of these areas are considered to be non-compliant with respect to coal quality. No known surface deformation or damage to structures has been reported as a result of these structural conditions (Eggerud 2007).

Seismic Activity–There are no know records of underground mining-induced seismic activity in the vicinity of the study area. Underground mining-induced seismic activity is typically associated with higher-extraction ratio methods. Historical and current mining in the study area has involved low-extraction methods, and no significant impacts due to mining-induced seismic activity are expected.

Landslides–Underground mining-induced landslides may occur if groundwater or surface water flow rates change significantly. Any changes to flow rates may occur in areas where there is subsurface fracturing. Studies show that this subsurface fracturing typically occurs in areas where the overburden thickness is less than 100 feet thick (Blackburn 1997). Mining companies in the vicinity of the study area avoid these areas, leaving coal in-place in areas with less than 100 feet of cover.

Horizontal strains also have been evaluated in the area. The results have been compared to typical tolerance levels for streams and lakes defined in the *SME Handbook* (Hartman 1992). The results indicate that fracturing due to mining induced strains is not likely. Therefore, landslides are not expected to occur on lands in the vicinity due to mining activity. No impacts from mining induced fracturing resulting in changes in stream flow are expected.

Geology and mineral resource specialists conducted a literature search and contacted state agencies and the Applicants to identify the extent of landslide occurrences in the region and in the immediate vicinity of the geologic study area. The findings are listed below:

- Two landslides were identified near the Rockspring Camp Creek Mine during the spring and summer of 2003. During a site visit to the area, WVDEP determined that these landslides were naturally occurring. This determination was based on bent trees indentified in the area that are approximately 40 years old (Barton 2007c). According to the WVDEP, there is no evidence that these landslides were caused by mining activities (Eggerud 2007).
- According to the WVDEP, some slips have occurred during contour or regrading work but these slips did not result in any structural damage. The WVDEP is not aware of any reported landslides that were caused by underground mining activities (Eggerud 2007).
- No landslides, debris flows, or rock fall have been documented within the vicinity of the proposed lease tracts (Ashton 2007).

Although no naturally-occurring landslides have been documented or mapped within the proposed lease area, they are very common and numerous in the mountainous areas of West Virginia. Therefore, the probability that landslides occur naturally in the vicinity of the steeply sloped proposed lease tracts is high. No underground mining-induced landslides have been reported in the vicinity of the proposed lease tracts. Significant changes to groundwater or surface flow are not expected, and the probability of occurrence is low.

Failure of Barriers or Seals–Other potential surface impacts from mining include the potential for sudden releases of water from flooded mine workings. Known as a “blow out,” this can occur when the barrier

between the mined-out void and the surface is unable to withstand the hydrostatic water pressure caused by flooding of the mine workings.

As noted above (*see* Activities), the Applicants maintain outcrop barrier widths between 50 to 150 feet in accordance with state and federal regulations to minimize the potential for blow outs in existing underground operations, and commonly install wet seals at entries to the inactive mining areas. The potential for blow outs is most common in areas where there is jointing or fracturing, according to a study conducted by TEE Engineering (Blackburn 1997). Cases of blow outs at nearby mining operations have been reported (P&A various dates). The cause of these blow outs typically has been attributed to failure to maintain the outcrop barrier widths. In some cases, the outcrop barrier was not maintained because available maps were not accurate. Disturbed areas were reclaimed as required, violations were reduced to a non-assessable level, and no further actions were required (P&A various dates). The WVDEP is not aware of any significant effects caused by these reported "blow outs" (Eggerud 2007).

Based on discussions with WVDEP (Eggerud 2007), no known water replacement requests or water quality violations have been written for underground mining of the Coalburg/Winifrede coal seam in the vicinity of the study area. No known complaints regarding water quality or water supply were reported to be a result of underground mining of the Coalburg/Winifrede coal seam. The water quality of the Coalburg/Winifrede coal seam is good and, if seepage were to occur, the seepage may actually improve water quality in the receiving stream. Reports associated with hydrologic effects, such as water supply and water quality, are described in detail in sections 3.2 (Surface Water Resources) and 3.3 (Groundwater Resources).

Surrounding Area–Mining–Trends–Permitted mining activities, in compliance with state and federal laws and regulations, are expected to continue in the future.

3.1.1c5 Surrounding Area–Oil and Gas Development

Most shallow oil and gas wells in Wayne County reach depths of 1,000 to 3,000 feet (Maggard 2007a). Deeper wells reach a depth of 11,000 feet (Ryder and others 2005). In 1997, the deepest well in Wayne County had been drilled to a depth of 14,625 feet. This well encountered the Precambrian basement (WVGES 2007b). In 2001, seven wells penetrated the Silurian Formation, one well penetrated Mississippian Formation, and three wells penetrated Devonian Formation (WVGES 2005).

Existing Impacts–The oil and gas resource is being extracted for use in energy production. In addition, if oil and gas wells are installed in active coal mining areas, the coal company mining in the area is required to leave a protective pillar in-place around the well, rendering part of the coal reserve inaccessible. No other impacts to geology associated with existing oil and gas development activities have been identified.

Trends–Oil and gas development are expected to continue in the future.

3.1.1c6 Surrounding Area–Other Activities

No underground activities other than mining and oil and gas development occur in the area surrounding the proposed lease tracts. On the surface, recreational activities including hiking, mountain biking, hunting, fishing, boating, ORV use, and commercial logging occur in the area surrounding the study area. A photograph of an area on the USACE East Lynn Lake Project impacted by ORV use is included in

appendix C (photograph C-5). Mountain biking, ORV use, and logging activities may contribute to erosion and localized damage to soils. Small-scale illegal logging may make slumping more likely by removing trees that stabilize soil. All of these on-going activities are expected to continue in the future.

3.1.2 Environmental Consequences

3.1.2a Scoping Issues

During the scoping process, the following issues of concern were identified that relate to geology and mineral resources:

- potential effects on roof and floor stability due to seismic activity or presence of faults and linear features
- potential effects on the integrity of the dam, other lake containment features, existing gas wells, cemeteries and other structures due to potential mining induced fracturing
- potential effects of mineral reserves, such as oil and gas or coal seams above the Coalburg/Winifrede coal seam, due to the proposed mining
- potential effects of mining near abandoned or inactive mine workings due to the proposed mining
- potential effects on drainage, the East Lynn Lake dam, cemeteries, residential water wells, pipelines, and other surface structures due to potential subsidence and roof and floor failure
- potential effects on lakeshore sedimentation, surface structures and water levels due to mining induced landslide activity (man-made slope failures)

3.1.2b Significance Criteria

To assess significance of impacts to geology and mineral resources, the following criteria are used:

- pillar strength compared to pillar stress, roof or floor failure, and potential surface deformation, using the Bieniawski method described in *Surface and Subsidence Engineering* (Peng 1992) as shown in table 3.1-2
- damage to structures caused by mining-induced subsidence, at a severity index rating of one or higher, using the classification by Bruhn provided in *Surface and Subsidence Engineering* (Peng 1992) as shown in table 3.1-1
- damage to structures–including road surfaces, dislocation of dam structures, lake containment features, recreational facilities and cemeteries–caused by tensile strains (Table 3.1-3), using the USBM Information Circular 8741 (Babcock and Hooker 1977) as shown on figure 3.1-14; *Surface and Subsidence Engineering* (Peng 1992) as shown on figure 3.1-14; or, National Coal Board 1975 (NCB 1975) as shown in Table 3.1-3
- potential for activation of faults based on distance from nearest documented seismic activity
- potential for occurrence of mining-induced landslides
- failure to maintain barrier width required by state and federal regulations
- inaccessibility of coal (quantified in tons or dollars)

3.1.2c Impacts–Proposed Action (Preferred Alternative)

3.1.2c1 Impacts–Proposed Action–Subsidence

Mining can cause vertical movement and horizontal strain of the rock that lies over or under the coal seam being mined, as described in appendix E. This vertical and horizontal movement can lead to surface subsidence. Subsidence impacts from existing mining activities in the vicinity of the study area are described above (*see* Affected Environment–Surrounding Area–Mining–Impacts). Potential subsidence impacts from the proposed mining are described below.

Roof Support–Under the Proposed Action, room-and-pillar mining with partial extraction, or "first mining only," is proposed. Pillars left in-place after mining support the roofs in room-and-pillar mines with partial extraction. Provided the pillars left in place are sized appropriately, roof collapse and surface subsidence effects would be minimized or prevented.

Information presented in the Applicants' various permit applications and other documents include estimates of the factor of safety for pillars. Calculations by Argus, using the well-established Bieniawski method, and using laboratory data on coal strength, indicate that the typical 50-ft x 50-ft pillar size at an extraction ratio of 49 percent would have a factor of safety against failure of 1.85, based on a laboratory value for coal strength of 3,500 pounds per square inch (psi). Rockspring typically uses the "analysis of retreat mine pillar stability" method developed by the National Institute for Occupational Safety and Health (Rockspring 2004) to determine the safety factor.

To verify the stability of the pillars within the proposed lease tracts, the geology and mineral specialists performed independent calculations using typical pillar geometry provided by the Applicants (P&A 2000a, and Rockspring 2004). The specialists compared these values to those specified in the RFDS. The results are presented in table 3.1-2 and are sufficient for stability of the pillars if post-mining conditions are as projected.

Even if pillars are adequately sized, the overburden can be subjected to various degrees of movement from weak floor material, leading to pillar punching, or from caving or fracturing of the exposed mine roof. Given the proposed sizing of pillars and the resulting load concentration factors, pillar punching does not seem likely, nor was any evidence of this seen during a tour of Rockspring's underground facility in October 2006. In the absence of second mining, the pillar sizes are generally large enough to support the overburden and fracture zones are not present, and this appears to be the case in the lease areas. It appears that localized cave zones noted during the specialists' visit to Rockspring's underground facilities in October 2006 are unlikely to extend more than a few feet upwards and are therefore unlikely to contribute to surface subsidence. Stability of pillars would be addressed during the permitting process.

The successful bidder(s)' mining engineers would design the sizes of the pillars, using available information to determine the size needed to support the roof and minimize vertical movement and subsidence. The successful bidder(s) also would use best management practices (BMPs) such as cribbing and other control measures (*see* photograph, C-8, of roof bolter in appendix C) to stabilize the roof and floor in weak areas. As a result, minimal subsidence is expected.

Furthermore, as described above (*see* Geology and Mineral Resources–Affected Environment), a single incident involving a subsidence crack (figure 3.1-16) has occurred in the partial extraction, room-and-

pillar mines in the area surrounding the proposed lease tracts. This subsidence crack did not result in damage or harm to any surface structures so the severity index of this incident is zero according to the subsidence damage criteria identified in table 3.1-1, above (*see* Affected Environment–Surrounding Area). The area was mitigated as requested by the governing regulatory agency and no further action was required. Subsidence is expected to be minimal for the Proposed Action.

As noted above (*see* Geology and Minerals–Existing Environment), the Applicants are actively mining the Coalburg/Winifrede seam in accordance with existing WVDEP-approved permits. In a few cases, the Applicants have encountered areas where roof conditions were poor. When they could not maintain appropriate factors of safety through engineering controls, the Applicants abandoned the unsafe areas. In contrast, the Applicants consider the federal coal to have better physical properties than other remaining coal reserves outside their existing, permitted areas. In addition, the federal coal is closer to the existing reserves and would require less transportation and handling than some of their other reserves (Saunders 2008). Geotechnical and hydrologic issues associated with poor roof and floor conditions would be addressed during the mine planning and permitting stage.

Strain–Most of the standard techniques for estimating subsidence profiles have been developed for total extraction (longwall) or high extraction ratio (second-mined room-and-pillar) operations (Peng 1992, and National Coal Board 1975). These methods may not typically be used for estimating subsidence over low extraction ratio partial-extraction room-and-pillar panels, where pillar collapse and roof failure is not predicted. However, specialists applied these conservative methods to demonstrate that the expected surface strains will be very small.

For example, at a depth of about 600 feet and the proposed extraction ratio of 50 percent, the pillar stress would be about 1,320 psi. Assuming a Young's modulus of the coal of 0.5 x 106 psi (Peng 1992, Table 4.17) a pillar vertical strain of 2.64×10^{-3}, or a pillar deformation of 0.19 inch for a 72-inch seam and pillar height is estimated. Assuming that the total deformation of the roof in the panel would be equal to the pillar deformation, subsidence can be estimated using empirical methods.

For example, using the empirical data from the U.K. National Coal Board (Figure 4.30 in Peng 1992, Figure 3 in NCB 1975), the ratio of maximum vertical subsidence to the seam deformation (S/m) at a depth of about 600 feet (183 m) and a panel width of 660 feet (201 m) would be about 0.85, giving a value for maximum vertical subsidence of about 0.16 inch. Also, using the NCB empirical data (Figure 4.34 in Peng 1992, Figure 15 in NCB 1975), the value for the horizontal strain at this panel width and depth would be approximately 1.3×10^{-5}, or at least two orders of magnitude below the tolerable range presented in table 3.1-3. For a similar panel configuration at a depth of about 100 feet, the maximum vertical subsidence might be approximately 0.04 inch and the strains may be around 1.5×10^{-5}.

Table 3.1-3
Horizontal Strain Tolerance Levels

Surface Features	Tolerable Range	
	Horizontal Strain (inches/inch)	Slope (feet/foot)
Pasture, woodland, range, or wildlife food and cover	$5.0–10.0 \times 10^{-3}$	$250–660 \times 10^{-3}$
Wetlands	5.0×10^{-3}	$30–80 \times 10^{-3}$
Lakes, ponds, marshes, rivers, streams	$5.0–10.0 \times 10^{-3}$	

Areas Where Overburden is Equal to or less than 100 Feet Thick–As described above (*see* Affected Environment–Structural Features), naturally-occurring fractures in the stress-relief zones are generally vertical along valley walls and horizontal under valley floors. This natural fracturing typically extends to a depth of approximately 50 to 100 feet bgs (Blackburn 1997; Wyrick and Borchers 1981). Jointing and fracturing decrease with depth.

The successful bidder(s) would not mine in areas where the overburden is less than 100 feet to reduce the likelihood of intercepting fractures. The successful bidder(s) may need to mine or tunnel under a stream to access the federal coal under the proposed lease tracts. In these cases, the successful bidder(s) would adjust pillar sizes to increase the pillar strength and minimize the potential for surface impacts. A line indicating the locations where overburden is 100 feet thick is shown on figure 3.1-18.

In addition, as described above (*see* Affected Environment–Activities), mining-induced landslides are most likely to occur if groundwater or surface water flow patterns are changed significantly. The stress-relief fracture zone found in the valley bottoms in the vicinity of the proposed lease tracts typically coincides with areas with less than 100 feet of cover. Under the RFDS, no mining would be performed in these areas other than the limited extraction needed to access the federal coal under the proposed lease tracts. In addition, horizontal strains have been evaluated in the area. The results have been compared to typical tolerance levels defined in the *SME Handbook* (Hartman 1992). The results indicate that fracturing due to mining induced strains is not likely. Therefore, landslides would not be expected to occur due to proposed mining activity. No impacts from mining-induced fracturing resulting in changes in stream flow are expected.

3.1.2c2 Impacts–Proposed Action–East Lynn Lake Dam

Under the RFDS, no mining would be performed within 1,585 feet of the East Lynn Lake dam. A 200-ft protective barrier would be maintained around the dam (as shown on figure 3.1-14), in accordance with recommendations in USBM Information Circular 8741 (Babcock and Hooker 1977).

To assess the potential for impact to the dam structure, geology and resource specialists calculated the potential subsidence bowl (figure 3.1-15) for the federal coal using a coal seam depth of 600 feet and the angle of draw of 30 degrees. The specialists found that the farthest extent of subsidence effects would be 314 feet from the edge of mining. For a mining depth of 100 feet, the extent of subsidence effects would

be 52 feet. Any potential subsidence effects caused by the proposed mining would be 1,266 feet or 1,528 feet, respectively, from the dam. As described above (*see* Proposed Action–Subsidence–Strain) and in appendix E, the strain tolerance level for a coal depth of 600 feet would be 1.3×10^{-5}. For a coal depth of 100 feet, the strain tolerance level would be 1.5×10^{-5}. Either of these values is two orders of magnitude below the tolerable range presented in table 3.1-3.

Evaluating a specific situation, the USACE maintains a building located approximately 350 feet southeast of the dam (figure 3.1-17). This structure is located 1,250 feet from the edge of the closest proposed lease tract. The coal seam is 266 feet bgs in this area. If mining were actually proposed under this building, then a protective barrier would be established under the building, using the typical design shown on figure 3.1-14. As shown on figure 3.1-17, a 15-ft distance would be extended out from the structure footprint, then an angle of draw of 30 degrees would be applied to establish a protective zone under the building. That protective zone would extend 154 feet laterally in all directions from the building. In actuality, this building is located outside of the proposed lease tracts. If the RFDS is implemented, the closest mining would occur 1,096 feet from the edge of the building's protective zone.

At the edge of the proposed lease tract closest to this USACE building, the coal seam is 230 feet bgs. Applying a 30 degree angle of draw, the area of potential subsidence would extend 141 feet laterally in all directions from the edge of the proposed lease tract. The edge of this potential area of subsidence would be 940 feet from the edge of the protective zone for the USACE building near the dam. Furthermore, under the RFDS no mining would occur at the edge of the proposed lease tract closest to the USACE building near the dam. Under the RFDS, the closest proposed mining is likely to occur more than 100 feet from the edge of the proposed lease tract boundary.

The only possible impact to the dam structure from proposed mining at this distance could be a change in fluid pressures as a result of flow towards a subsidence bowl. However, given the minimal expected subsidence effects, this potential is viewed as unlikely. No impacts to the dam are expected under the RFDS.

3.1.2c3 Impacts–Proposed Action–East Lynn Lake

Under the RFDS, the successful bidder(s) would not mine under the lake and would maintain a 200-ft protective barrier around the lake (BLM 2009). The 200-ft protective barrier is based on guidance in the USBM Information Circular 8741 (Babcock and Hooker 1977), which is commonly used to assess the adequacy of overburden near or under impounded surface water bodies (Joint Work Group 2003). The guidelines recommend a lateral barrier width of 200 feet around surface water impoundments (such as East Lynn Lake). The recommended barrier extends downward an additional 350 feet and then outward at an angle of 65 degrees from the horizontal. No extraction is recommended within this barrier zone (figure 3.1-14). The proposed 200-ft barrier from the maximum pool elevation of the lake, defined as the spillway elevation of 701 feet amsl is shown on figure 3.1-18.

In addition, no mining would occur under areas with less than 100 feet of overburden (figure 3.1-18). In many cases, the area where overburden is 100 feet thick or less is farther away from the lake than the proposed 200-ft protective barrier. As described above (*see* Proposed Action–Subsidence–Strain) and in appendix E, the strain tolerance level for a coal depth of 100 feet would be 1.5×10^{-5}. This value is two orders of magnitude below the tolerable range presented in table 3.1-3. Lastly, a 150-ft outcrop barrier

would be maintained wherever the Coalburg/Winifrede seam outcrops (figure 3.1-18). Again, this 150-ft barrier would often be located more than 200 feet from the edge of the lake at a water-surface elevation equal to the spillway elevation of 701 feet amsl.

Maintenance of the proposed 200-ft horizontal barrier around the lake, avoidance of areas with less than 100 feet of overburden, and maintenance of the 150-ft outcrop barrier width is expected to minimize the potential for subsidence or blow-outs, and significant impact to East Lynn Lake due to the Proposed Action is unlikely.

3.1.2c4 Impacts–Proposed Action–Gas Wells

West Virginia Code (§22A-2-75) requires mining companies to notify oil and gas companies whenever mining will be performed within 500 feet of an existing oil and gas well and to obtain written approval to mine within 200 feet of an oil or natural gas well. Mining companies are required to maintain a certain pillar size around a gas well to prevent damage to the structure and to prevent or minimize the risk of explosion (West Virginia Code §22A-2-75), along with West Virginia Office of Miners' Health Safety &Training (WVMSHT) and MSHA policies and regulations. Under the RFDS, protective barriers up to 200 feet in radius would be maintained around existing gas wells, in compliance with federal and state regulations. The minimum barrier width for gas wells recommended by the USBM (Babcock and Hooker 1977) is 150 feet.

For new oil and gas wells, the oil and gas company must submit an application to drill a well, and landowners, mineral rights owners, lessees, and operators have the opportunity to protest. If a permit to drill is approved and the proposed well location is situated in an active mining area, the oil and gas company and the potentially affected mining company typically negotiate a suitable location, preferably within a pillar (West Virginia *Code of State Rules* §22A-2-75).

No impacts to gas wells are expected under the RFDS.

3.1.2c5 Impacts–Proposed Action–Other Structures

If the Proposed Action is selected and the RFDS is implemented, the successful bidder(s) would perform 50 percent extraction both within the angle of draw defining the protective barrier and throughout the area to be mined. Use of this low extraction ratio would exceed recommended protective barrier designs for use around structures shown on figure 3.1-14, and would further minimize potential effects. Potential effects to future structures also would be reduced. The successful bidder(s) would maintain protective barriers near structures to comply with federal and state regulations. Similar mining methods have been used in the room-and-pillar mines under private lands that adjoin the proposed lease tracts, and no surface structure damage due to underground mining has been reported.

The WVDEP is the regulatory agency responsible for issuing violation, complaint and inspection reports for mining activities. Scott Eggerud, WVDEP, was contacted to identify non-compliance issues related to the active operations in the vicinity of the proposed lease tracts. Mr. Eggerud has inspected many of the current mining activities for the Applicants between the years 1992 through 2000. According to Mr. Eggerud, the Applicants' performance in meeting compliance for underground mining activities of the Coalburg/Winifrede coal seam has been above average. In addition, WVDEP is not aware of any

significant structural damage reported due to underground mining of the Coalburg/Winifrede coal seam (Eggerud 2007).

The geology and mineral resource specialists' calculations show that proposed mining would produce strain levels that would be within tolerance levels for natural surface features (table 3.1-3). Compliance with state or federal requirements, in conjunction with pillar size adjustments and avoidance of mining in areas where overburden is 100 feet or less, is expected to provide adequate protection for streams. With regard to recreational facilities located near the lakeshore, the 200-ft protective barrier would provide subsidence protection to those surface facilities.

3.1.2c6 Impacts–Proposed Action–Coal Outcrops

The potential for sudden releases of water from flooded mine workings, or "blow outs," can occur when the barrier between the mined-out void and the surface is unable to withstand the hydrostatic water pressure caused by flooding of the mine workings. "Blow outs" are most common in areas where there is jointing or fracturing, according to a study conducted by TEE Engineering (Blackburn 1997), as described above (*see* Affected Environment–Surrounding Area–Failure of Seams and Barriers).

It is probable that after the proposed mining, the remaining void would flood over time. The Applicants have provided calculations for the necessary size of barriers adjacent to outcrops to contain this water, reduce seepage, and prevent blow outs. Under the RFDS, a 150-ft protective barrier would be maintained in locations where the coal seam outcrops at the surface (BLM 2009). Typical outcrop barrier widths used in nearby underground mining are sized conservatively to prevent seepage of any contained water. Provided that proposed barrier widths are maintained, no impacts from seepage are expected. The water quality of the Coalburg/Winifrede coal seam is good (appendix G). If seepage were to occur, the seepage may actually improve water quality in the receiving stream (Eggerud 2007).

As described above in section 3.1.1a (Affected Environment–Structural Features), natural fracturing typically extends to a depth of approximately 50 to 100 feet bgs (Blackburn 1997; Wyrick and Borchers 1981). Jointing and fracturing decrease with depth. The successful bidder(s) would not mine in areas where the overburden is less than 100 feet to reduce the likelihood of intercepting fractures. Because "blow outs" commonly occur in fractured or jointed areas and the successful bidder(s) would not mine in these areas, the potential impacts from seepage would be further reduced. For a coal depth of 100 feet, the strain tolerance level would be 1.5×10^{-5}. This value is two orders of magnitude below the tolerable range presented in table 3.1-3.

Although cases of "blow outs" operations have been reported at nearby mines (P&A various dates), the WVDEP is not aware of any significant effects caused by these reported "blow outs" (Eggerud 2007), as described above (*see* Geology and Mineral Resources–Affected Environment).

Geology and mineral resource specialists created a cross section (presented on figures 3.1-19 through 3.1-22) to verify overburden thickness data provided by the Applicants and address concerns about reported discrepancies in survey data related to overburden thickness and "blow outs." The following information was used to create the cross section:

- structure contours provided by both Applicants, including coal seam elevation contours
- overburden thickness provided by Rockspring

- State Plane NAD 83 surface elevations
- surface elevations provided by the Applicants

The coal seam structure elevation defines the depth from the surface to the coal seam and represents the overburden thickness.

The surface elevations from each source were overlaid on the cross section. The results indicate that variations in surface elevations between the sources listed above are negligible and overburden thicknesses estimated by the Applicants are expected to be adequate. The overburden thickness contour information provided by Rockspring also correlates with the results from the surface elevation and coal seam structure elevations.

Based on discussions with WVDEP (Eggerud 2007), no known water quality violations or water replacement requests have been written for underground mining of the Coalburg/Winifrede coal seam in the vicinity of the study area. No known complaints regarding water quality or water supply were reported to be a result of underground mining of the Coalburg/Winifrede coal seam. Reports associated with hydrologic effects, such as water quality and water supply, are described in detail in sections 3.2 (Surface Water Resources) and 3.3 (Groundwater Resources). Proposed mining methods and ground control measures would be similar to those used in the adjoining, permitted mines. No significant impacts to structures would be expected under the RFDS.

The proposed 150-ft outcrop barrier is expected to adequately minimize the potential for "blow outs" or seepage.

3.1.2c7 Impacts–Proposed Action–Seismic Activity and Faults

As described above (*see* Affected Environment), no significant seismic activity has occurred near the proposed lease tracts. Other naturally-occurring minor slumps or displacements were either a result of regional movements or did not result in surface deformation. No active faults are known to be present near the proposed lease tracts. Therefore, impacts due to faulting or seismic activity are expected to be minimal.

3.1.2c8 Impacts–Proposed Action–Landslides

As described above (*see* Geology and Mineral Resources–Affected Environment), no landslides, debris flows, or rock fall have been documented within the USACE East Lynn Lake Project (Ashton 2007), and no significant landslide events due to mining have been reported in nearby mining areas (Eggerud 2007).

Proposed underground mining-related activities described in the RFDS do not involve excavation or overloading of the surface in a way that might lead to a greater probability of landslides. Mining-induced landslides are most likely to occur if there are significant changes to groundwater or surface water flow. Any changes to flow rates are most likely to occur in areas where there is subsurface fracturing. Studies show that fracturing typically occurs in areas where the overburden thickness is less than 100 feet thick (Blackburn 1997). No mining is proposed in these areas. In addition, horizontal strains have been evaluated in the area. The results have been compared to typical tolerance levels defined in the *SME Handbook* (Hartman 1992). The results indicate that fracturing due to mining induced strains is not

likely. Therefore, minimal to no fracturing is expected, and changes in groundwater or stream flow are not expected. Landslides are not expected to occur as a result of the proposed mining activity.

Water resource specialists expect that proposed mining would not increase the water table or cause any rapid drawdown. Therefore, no changes in water flow are expected, and the likelihood of mining-induced landslides is expected to be low.

3.1.2c9 Impacts–Proposed Action–Coal Reserves

Coalburg/Winifrede Coal Seam–Approximately 76 million tons of coal exists below the proposed lease tracts, and approximately 26 million tons of clean coal is recoverable from that reserve, according to the RFDS (BLM 2009; presented in appendix B). The RFDS states:

> Coal prices determine the revenue received by the federal government from coal mining operations. A royalty rate of 8 percent of the coal sold from underground mines is due to the U.S. Minerals Management Service; 75 percent of this revenue is then transferred through to the State of West Virginia to local governments.
>
> Should all the recoverable coal be mined at the current price of about $43/ton, then the state government would receive approximately $67.8 million over a period of about 15 years. The distribution of these revenues to local governments and agencies is governed by state law.

This estimated revenue does not account for loss in revenue resulting from loss of coal left in place in protective barriers.

If the Proposed Action is selected and the RFDS is implemented, the successful bidder(s) would leave approximately 50 percent of the coal in place in the form of pillars designed to minimize or eliminate subsidence. In addition, the successful bidder(s) would be required to leave coal in place to act as one of several types of protective barrier.

For example, a pillar of coal with a diameter of up to 200 feet would have to be left in place in the vicinity of a gas well. Up to 7,800 tons of coal would form this one protective barrier and would not be recovered. At least 144 gas wells exist within the proposed lease tracts (BLM 2009). The successful bidder(s) likely would design mining panels by placing their pillars in locations that could serve as the protective barrier required to protect an existing gas well.

Up to 20 additional gas wells may be installed over the next 5 years, according to attachment 1 of the RFDS. It is unlikely that more than 20 wells will be drilled in the proposed lease area. Well lives in this area may exceed 20 years (BLM 2007b; appendix B). Potential impacts from these 20 additional wells are expected to be low compared to the total amount of recoverable coal.

Other proposed barriers include a 150-ft wide outcrop barrier and a 200-ft wide barrier around the lake. No mining would occur in areas where overburden is equal to or less than 100 feet deep. Coal reserves left in these barriers, or no mining zones, would not be recoverable and would reduce recoverable coal reserves.

Other Coal Seams–Any shallow house mines located within the proposed lease tracts are expected to be located in the No. 5 block coal seam. No commercial abandoned mines are known to exist within the proposed lease tracts. The proposed mining is not expected to impact these abandoned mines.

TEE Engineering Co., Inc. (Blackburn 1997) conducted a study to address the potential for significant loss of coal reserves in coal seams above the Coalburg coal seam due to proposed mining under the proposed lease tracts. This loss could occur if mining of the lower seam affected the stability of the upper seam. The assumed mining method involved a 50 percent extraction ratio, with no second mining. The researchers determined that there is little or no potential for significant loss of coal reserves in upper coal seams. In fact, mining of the lower Coalburg coal seam first was encouraged (Blackburn 1997). The upper coal seams lie in an area where fracturing and jointing is more likely. If the upper coal seam has a greater potential for retaining a substantial amount of water, then this water could migrate through fractures into the lower Coalburg seam which could create adverse conditions for the Coalburg reserves.

Mining of the Coalburg/Winifrede coal seam that lies under the proposed lease tracts is expected to have minimal effects on coal reserves that lie above it. If surface or underground mining of the No. 5 Block and other seams on the proposed lease tracts were proposed, the proponent would be required to submit a lease-by-application, and complete NEPA-compliant analyses and appropriate federal and state permitting processes prior to mining. Surface mining of the reserves lying over the Coalburg/Winifrede would be expensive and likely economically infeasible.

3.1.2c10 Impacts–Proposed Action–Oil, Natural Gas, and Coal Bed Methane Reserves

Oil and Natural Gas–If the Proposed Action is selected and the associated RFDS is implemented, the successful bidder(s) would perform underground mining of the Coalburg/Winifrede seam within the proposed lease tracts. No impacts to gas wells are expected as a result of the Proposed Action and associated RFDS.

In addition, oil and gas companies would likely develop 12 to 20 oil and gas wells within the proposed lease tracts. Submittal of additional oil and gas permit applications are expected, given the existing natural gas reserves that are below southern West Virginia, including the USACE East Lynn Lake Project area, and more specifically the proposed lease tracts, and given the level of natural gas development activity in the region.

As described above (*see* Proposed Mining Impacts to the Coal Reserves), the successful bidder(s) would be required to leave a pillar of coal with a diameter of up to 200 feet in-place around each existing gas well. Up to 7,800 tons of coal would form this one protective barrier and would not be recovered. At least 144 gas wells exist within the proposed lease tracts (BLM 2009), and 12 to 20 more wells are proposed in the RFDS for gas wells, presented in the attachment to the RFDS (BLM 2007b).
The successful bidder(s) likely would design mining panels so that a pillar required to surround an existing well would coincide with a location where a pillar is needed, and potential impacts from these 20 additional wells are expected to be low compared to the total amount of recoverable coal.

Coal Bed Methane–If the Proposed Action is selected and the associated RFDS is implemented, the successful bidder(s) would perform underground mining of the Coalburg/Winifrede seam. Coal bed methane is produced in parts of West Virginia, but there are no wells reported in Wayne County (WVGES 2009). The likelihood of recovery of coal bed methane within the proposed lease tracts is low

to medium, and impacts to coal bed methane resources are expected to be low to medium under the Proposed Action (Limerick 2004).

3.1.2d Impacts–No Action

3.1.2d1 Impacts–No Action–Geology–Coal Reserves

Under the No Action Alternative and the NAS, the LBAs would be rejected, allowing the federal coal to remain in place and would not be leased or mined. No impacts to geology are expected.

3.1.2d2 Impacts–No Action–Mineral Resources–Coal Reserves

Under the No Action Alternative, the NAS would be implemented, and the LBAs would be rejected, allowing the federal coal to remain in place and not be leased or mined. Approximately 26 million tons of coal reserves from the Coalburg/Winifrede coal seam would not be recovered. Based on a current price of about $43/ton as identified in the RFDS, a potential loss in state revenue of approximately $68.4 million would occur over a period of 15 years.

In addition, continued mining on adjoining private lands may leave minimal to no access to the federal coal in the future, potentially making the coal reserves inaccessible. Furthermore, if the federal coal were to be mined in the future, potential surface impacts would be greater since the existing operations and maintenance facilities would potentially be closed and unavailable for use. Therefore, new processing and waste storage facilities would be required.

Up to 20 oil and gas wells could be drilled on the proposed lease tracts over the next 5 years (BLM 2007b). If, through a later lease, the federal coal were to be mined after installation of these wells, the successful bidder(s) at that time would have to leave protective barriers with a diameter of up to 200 feet and up to 7,800 tons of coal in place around those wells. Up to 156,000 tons of coal would be unrecoverable, and the potential for coal reserves to become inaccessible over time is high under the NAS. Revenues would be lost, with a potential reduction in revenue of $6,708,000 at current prices of $43 per ton of coal.

3.1.2d3 Impacts–No Action–Mineral Resources–Oil, Natural Gas, and Coal Bed Methane Reserves

Under the No Action Alternative, the NAS would be implemented, the LBAs would be rejected, allowing the federal coal to remain in place and would not be leased or mined. The current management situation would continue, and oil and gas development would continue. No impacts are expected, other than extraction of the oil and natural gas reserves. The likelihood of recovery of coal bed methane from the federal coal that lies under the proposed lease tracts is low to medium, and no significant impacts are expected.

3.1.2e Mitigation Measures

No significant impacts to geology, mineral resources, structural features, or geologic hazards are expected under the Proposed Action or No Action Alternative. Therefore, no mitigation measures are required.

3.1.2f Residual Impacts

No significant impacts to geology, mineral resources, structural features, or geologic hazards are expected under the Proposed Action or No Action Alternative. Therefore, no residual impacts are expected under the Proposed Action or No Action Alternative.

3.1.2g Monitoring Recommendations

No significant impacts to geology, mineral resources, structural features, or geologic hazards are expected under the Proposed Action or No Action Alternative. Therefore, no monitoring beyond what is required by applicable regulatory agencies is expected to be necessary.

3.2 SURFACE WATER RESOURCES

Surface water resources include rivers, streams, lakes, ponds, and areas where groundwater discharges to the surface, including seeps and springs. A seep is a small area where groundwater drips slowly to the land surface. A spring is a place where a concentrated discharge of groundwater flows at the ground surface. Springs have the potential to form where a coal seam contacts a shale or claystone layer (Hobba 1993). As surficial expressions of groundwater, seeps and springs are described with other surface water resources.

When rain or snow, together called precipitation, falls and lands on the ground surface, some of that water soaks into the ground, while the rest of the water runs across the land. Some of the water that runs across the land gradually soaks into the leaf litter on the surface or into the soil. Some of the water that soaks into the soil near the surface evaporates during dry periods and some provides water to the roots of plants, and the water then transpires from the leaves back into the atmosphere. The rest of the water flows across the land and into streams, rivers, ponds, or lakes.

The water that soaks into the ground flows down into shallow aquifers and recharges those aquifers. Water in the aquifers is referred to as groundwater, and may move into deeper aquifers or flow back onto the surface as springs or seeps. Some of the groundwater may also flow into streams, rivers, ponds, or lakes, recharging those surface-water resources.

When specialists need to describe surface water resources in a particular area, they often select one stream or river in the area, and draw a boundary around the area of land drained by that stream or river. This area is referred to as a drainage basin or a watershed. Specialists describe the surface water resources within that watershed in terms of quantity and quality. If either water quantity or quality is impacted, other resources such as vegetation, wildlife, or socioeconomics in the form of human health can be impacted.

Federal Mineral Resources regulations (30 CFR 701.5) define perennial and intermittent streams as follows:

- A **perennial stream** is a stream or part of a stream that flows continuously during all of the calendar year as a result of ground-water discharge or surface runoff. The term does not include intermittent stream or ephemeral stream.

- An **intermittent stream** is:
  a) a stream or reach of a stream that drains a watershed of at least one square mile, or
  b) a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface runoff and groundwater discharge.

Quantity–Stream water quantity is typically evaluated in terms of stream flow, which is measured in cubic feet per second (cfs). Stream flow can be affected by precipitation, groundwater interactions, surface coal mining, or the presence of abandoned underground mines. Natural stream flows are strongly correlated with precipitation in short-term and long-term cycles. Groundwater can either supply water to streams or take water from streams, depending on the relationship between the water level in the stream and the water level in the adjacent aquifer.

Surface water quantity also can be described as a volume measured in acre-feet.

Quality–Surface water quality is described and measured based on several properties of water. Chemical properties include pH measured in standard units, and concentrations of chemicals such as iron and sulfate, which are typically measured in milligrams per liter (mg/L). A pH value is a relative measure of how acidic or basic the water is, with pH values below 7 classified as acidic, and pH values above 7 classified as basic. Most natural waters have pH measurements in the range of about 6 to 9.

Physical properties include the amount of dissolved minerals and silt, clay, or other particles, referred to as total dissolved solids (TDS), which is measured in mg/L. The amount of suspended material, called total suspended solids (TSS) can also be measured in mg/L. Biological properties include the amount of dissolved oxygen (DO) in the water measured in mg/L.

The federal *Clean Water Act* (CWA) requires reporting on the quality of the Nation's waters. Water quality standards (WQS) include three major components (USEPA 2007g):

- designated uses
- water quality criteria
- anti-degradation provisions

If monitoring and assessment indicate that for some uses and/or parameters, a water body or segment is not meeting WQS, then that water is considered "impaired" and goes on a special list. This list, called the "303(d) list," is named after the section of the CWA that calls upon states, approved tribes, and territories to create such lists (USEPA 2007e).

Naturally-occurring conditions, such as the chemical makeup of rock formations, or animal activity in a stream, river, pond or lake can affect the chemical, physical and/or biological properties of that water source. Seasonal changes in rain or snow fall affect the volume of surface water in a stream, river, or lake. Water quality can change as this volume changes. Numerous existing human activities such as recreation, mining, oil and gas development, logging, or residential home construction also can affect surface water resources. Tracing changes in water quantity or quality to a particular source can be difficult.

3.2.1 Affected Environment

The affected environment for surface water resources evaluated in this FLUA/FEIS is situated primarily within the portion of the East Fork of Twelvepole Creek's watershed that is upstream of its confluence with Laurel Creek (figure 3.2-1). The affected environment study area includes the area covered by the proposed lease tracts and lands downgradient to the edge of the lake, the lake itself, the East Fork of Twelvepole Creek below the dam continuing downstream to the confluence of Laurel Creek and the East Fork of Twelvepole Creek, the East Fork of Twelvepole Creek from this confluence downstream approximately 10 miles to the confluence with the West Fork of Twelvepole Creek, and Twelvepole Creek from that point approximately 1 mile downstream to the town of Wayne's water intake.

Aspects of the affected environment include:

- topography,
- precipitation,
- surface water resource quantity and quality,
- any naturally-occurring impacts to quantity and quality,
- human development, and
- associated impacts to quantity and quality.

3.2.1a Topography

The East Fork of Twelvepole Creek watershed consists of deeply-eroded hills and valleys in the southwestern West Virginia Appalachian Plateau region. The nearest watershed divide is approximately one mile east of the proposed lease tracts. This divide separates the East Fork of Twelvepole Creek watershed from the Guyandotte watershed farther to the east. The other surrounding watersheds include the West Fork of Twelvepole Creek to the south and west, and Beech Fork to the west and north. The East and West forks join to become Twelvepole Creek south of the town of Wayne, which flows into the Little Scioto-Tygarts and eventually into the Ohio River.

Streams in the vicinity of the study area are shown on figure 3.2-1. Mean land slopes in the East Fork of Twelvepole Creek watershed range from 30 to 40 percent, while average stream channel slopes within the watershed and more specifically the proposed lease tract areas range from 10 to 50 feet per mile or 0.2 to 0.9 percent (Ehlke 1982). For example, Kiah Creek has stream slope averages of 25 to 50 feet per mile, while the East Fork of Twelvepole Creek has slopes ranging from 10 to 25 feet per mile. These ranges encompass the mid to low reported values for stream slopes in the southwestern part of the state (Ehlke 1982).

3.2.1b Climate

The climate of West Virginia is continental, with four distinct seasons. Based on the 30-year normals for the time period between 1971 and 2000, the mean annual temperature in the state is 51.8°F and the annual precipitation is 45.2 inches.

The temperature variation between summer and winter is quite large. Mean monthly summer temperatures are about 65-75°F, while mean monthly winter temperatures are about 25-40°F. Mean monthly temperatures in the state depend upon elevation (Paybins 2003). The highest temperatures occur near the Ohio River and the lowest in the mountainous areas.

About 60 percent of the state's annual precipitation occurs from March through August, with July typically the wettest month and October the driest. Precipitation increases from the Ohio River eastward to the Appalachian Mountains.

3.2.1c Precipitation

Federal and state agencies, along with private companies, gather precipitation data throughout the country. The National Oceanic and Atmospheric Administration (NOAA) collects monthly precipitation data at its climatic data station number 46-2622, East Lynn Lake, West Virginia. Data collected from that station between 1997 and 2006 indicate that average annual precipitation in the vicinity of the proposed lease tracts is 47.6 inches (NCDC 2006). Data collected at NOAA station number 46-9323, located north of the proposed lease tracts in Wayne, West Virginia, indicate that the 30-year average annual precipitation, referred to by resource specialists as the normal annual precipitation, is 44.71 inches for the period 1971 to 2000 (NCDC 2002). The normal annual precipitation at NOAA data station 46-2522, located south of the proposed lease tracts in Dunlow, West Virginia is 45.71 inches for the period 1971 to 2000 (NCDC 2002). The USACE (1974b) stated that the normal annual precipitation for the East Lynn Lake reservoir at that time was approximately 43.5 inches, with 21.0 inches of snowfall.

Precipitation contributes water to the streams that flow adjacent to or across the proposed lease tracts, and to the lake. Most of the precipitation falls as rain during the months of March through August, and these spring and summer rains contribute water to the intermittent streams that flow adjacent to or across the proposed lease tracts.

3.2.1d Surface Water Resources

Surface water resources within the study area include several streams that flow across the proposed lease tracts and discharge into the lake (figure 3.2-2). Small seeps and springs are likely to exist throughout the East Fork of Twelvepole Creek watershed. No seep or spring surveys have been performed on the proposed lease tracts.

Surface water flow and water chemistry data have been collected by public and private entities, including the USGS, the USACE, the WVDEP, Rockspring, and Argus. Sample locations are shown on figure 3.2-2 and are described below:

- **The USGS** has collected water quality samples at stations upstream and downstream of the lake.
- **The USACE** monitors water quality at locations on East Lynn Lake and its tributaries.
- **The WVDEP Division of Water and Waste Management** has collected samples at locations on the lake and its tributaries.
- **Rockspring** has collected samples from major tributaries to the lake that flow across or near its currently mined and permitted areas and/or its proposed lease tracts.

- **Argus** retains a third-party consulting firm, R. E. I. Consultants, Inc. (REIC) to collect streamflow, water quality, benthic macroinvertebrate, and fish data. Water quality samples have been collected from locations upstream and downstream of the lake, as well as from the major tributaries to the lake that flow across or near its past and present mining activities and/or its proposed lease tracts.

3.2.1d1 Streams

Figures 3.2-1 and 3.2-2 show the boundary of the East Fork of Twelvepole Creek watershed upstream of USGS gauging station number 03206790, located just below the confluence of Laurel Creek and the East Fork of Twelvepole Creek. The watershed covers a 139-square mile area in parts of Wayne and Lincoln counties. Seven major streams drain this portion of the watershed:

- Laurel Creek
- Lick Creek
- Cove Creek
- Kiah Creek
- the East Fork of Twelvepole Creek
- Rich Creek
- Brush Creek

Laurel Creek crosses Rockspring's proposed lease tract A and flows into the East Fork of Twelvepole Creek downstream of the dam. Surface water draining off of Rockspring's proposed lease tracts B and C flows into Lick Creek, which flows into the lake. Surface water draining off of Rockspring's proposed lease tracts C, D, and E flows into Cove Creek, which flows into the lake. Surface water draining off of Rockspring's proposed lease tracts E and F flows into Kiah Creek.

In addition, Kiah Creek crosses and then flows alongside Argus' proposed lease tract C before joining the East Fork of Twelvepole Creek, which then flows into the lake. Surface water draining from Argus' proposed lease tracts A and C flows into the East Fork of Twelvepole Creek and then into the lake. Surface water from Argus' proposed lease tract B flows into Rich Creek, Beechy Branch, Walker Branch, or the East Fork of Twelvepole Creek and then into the lake.

Surface water draining from the USACE East Lynn Lake Project lands west of the proposed lease tracts flows into Rich Creek and Brush Creek, both of which flow into the lake.

Quantity–The USGS, WVDEP and the Applicants have conducted stream flow monitoring in many streams surrounding the proposed lease tracts (figure 3.2-2). The USGS has monitored flows since the mid-1960s at several locations. Flows measured by the USGS in the East Fork of Twelvepole Creek near Dunlow, West Virginia (station number 03206600) from 1981 to 2006 ranged from less than 1 cfs in the dry months to 100 cfs in the wetter months, with peak flows as high as 300 cfs. Stream flow in smaller perennial streams, such as Frances Branch, ranged from no flow in the drier months to 16 cfs in the wetter months between November 2000 and April 2006 (USGS 2007).

The Applicants have monitored flows in different streams since 1996, and since 2000 they have regularly collected more data. Flow rates in larger perennial streams, such as Kiah Creek, range from a minimum

of 0.08 cfs in the drier months to a maximum of 70 cfs in the wetter months. This range is based on data from April 2000 to April 2006 (Argus 2006b).

Quality–Surface water quality depends upon streamflow condition, precipitation, geology, land and water use, and wastewater discharge. Within the East Fork of Twelvepole Creek watershed, the water quality varies for individual streams and stream reaches. The USACE (1974b) indicates that high concentrations of iron and manganese were present in streams within the East Fork of Twelvepole Creek watershed prior to the lake being impounded. Water samples collected in 1965 were found to contain iron concentrations that exceeded the Public Health Service's drinking-water standards at the time (USACE 1974b).

The USACE, the USGS, WVDEP, Rockspring, and Argus conduct surface water monitoring in major streams within the East Fork of Twelvepole Creek watershed, including tributaries to East Lynn Lake (figure 3.2-2). These monitoring data were used to assess baseline conditions of surface waters in the vicinity of the proposed lease tracts.

WVDEP implements a tiered anti-degradation rule (Wayne County 2004). Tier 2.5 waters are naturally producing trout streams, reference streams identified by WVDEP, or streams with a high biological score indicating high water quality. No significant degradation will be permitted in these streams, although short-term degradation may be allowed. None of the streams on the proposed lease tracts have been identified as Tier 2.5 waters. Within the watershed, Rich Creek has been identified as a presumptive Tier 2.5 water.

The WVDEP also maintains a list of water quality limited waters within the state. The WVDEP put several streams in the vicinity of the proposed lease tracts on its 303(d) list of impaired waterways in 2006 (WVDEP 2006a).

Streams within the surface water study area that are on the 303(d) list include:

- Cove Creek,
- Kiah Creek,
- Parker Branch,
- Rollem Fork,
- Copley Trace Branch,
- the East Fork of Twelvepole Creek,
- Maynard Branch,
- Honey Branch, and
- Rich Creek.

Cove Creek flows west past the proposed lease tracts and into the lake. Kiah Creek and its tributaries, including Parker Branch, Rollem Fork, and Copley Trace Branch, flow northwest across or past the proposed lease tracts and into the lake. The East Fork of Twelvepole Creek and its tributaries, including Maynard Branch and Honey Branch, flow north across or past the proposed lease tracts and into the lake. WVDEP listed these streams as biologically impaired (CNA-Biological) with unknown sources of impairment.

Rich Creek flows northeast across USACE East Lynn Lake Project lands and into the lake. WVDEP listed Rich Creek as impaired, citing an exceedance of the criterion for iron, but the source is unknown. No mining occurs in the Rich Creek watershed (Maggard 2007d).

Water quality in streams can be affected by natural events including precipitation and groundwater interactions, as well as human activities such as recreational activities, natural gas development, logging, and underground mining and surface mining (described below under the Human Development subsection). Precipitation typically contains very low concentrations of dissolved constituents, and is slightly acidic. Runoff from precipitation can dissolve minerals as it flows over the ground, and carry those dissolved materials (measured as TDS) into a stream. Groundwater can add dissolved materials to a stream, if there is a hydrologic connection between the two. How the quality of the groundwater affects the stream depending on the relative concentrations of dissolved minerals between the stream and the groundwater.

Figure 3.2-2 shows surface water sampling locations in the vicinity of the study area. Table 3.2-1 presents a summary of water quality data from USACE station 1ELT0032, located on Kiah Creek about 2.9 miles upstream of the confluence with the lake (Harlan 2007). Tables 3.2-2, 3.2-3, and 3.2-4 present summaries of water-quality data collected by Rockspring in the Big Laurel Creek watershed. Table 3.2-5 summarizes water quality data collected by Argus from Kiah Creek station BM-004 (Argus 2006b), located about 5.5 miles upstream of the confluence with the lake.

Historical mine adits have been identified on maps of the Big Laurel Creek watershed. As described in Rockspring's *Ben Haley South Area, Attachment J to Rockspring Permit U5028-95, Modification 2* (MM&A 2001), USGS topographic mapping indicates the presence of several No. 5 Block mine workings within the permit area. Two adits each are shown along and near Big Laurel Creek and an unnamed tributary of Cove Creek near the northwestern edge of the permit boundary. Base mapping also indicates a mine adit along Cove Creek approximately 3000 feet west of the mouth of Trace Fork. That mine is situated at the Stockton coal horizon. These mines are believed to be small in nature with very little areal distribution (MM&A 2001).

Currently, Rockspring is extracting coal from the Coalburg/Winifrede seam in its Ben Haley underground mine, located in the Big Laurel Creek watershed. Part of Argus' active Pigpen Branch No. 7 Deep Mine is located in the Big Laurel Creek watershed. Argus began operating this mine in 1998. As a result, the watershed is a good analog for expected conditions on the proposed lease tracts if the Proposed Action is selected and the RFDS occurs. No other activities associated with mining occur in the Big Laurel Creek watershed, which flows into Kiah Creek. Several operating and closed surface- and underground-mining facilities are located within the Kiah Creek watershed.

Water quality measurements show seasonal influences in the Big Laurel Creek watershed. Comparisons of upstream (Tables 3.2-2 and 3.2-3) to downstream (Table 3.2-4) concentrations indicate no increases attributable to mining activities in the watershed.

Water quality trends in Kiah Creek upstream from the confluence with the East Fork of Twelvepole Creek include increasing pH, TDS, and total sulfate, and decreasing total iron. These changes may be indicative of impacts from activities within the watershed, such as coal mining.

Since the mid-1990s, Argus has been monitoring stream habitat, benthic macroinvertebrate populations, and water chemistry in several streams near or within the proposed lease tracts. Results of these monitoring events indicate that surface-water quality may be impacted by coal mining. These effects appear to dissipate in the downstream direction below the mining operations. Other actions that may affect surface-water quality at the monitoring stations include use of dirt roads that cross the area. Runoff from these roads may deposit sediments, and may contribute TDS and other chemicals to surface water, thereby adversely impacting water quality. In addition, fecal coliform bacteria have been reported in several streams, indicating the discharge of waste from wildlife, from storm runoff, or from untreated human sewage (REIC 2000-2006).

3.2.1d2 East Lynn Lake

East Lynn Lake is a man-made reservoir constructed and operated by the USACE for flood control, recreation, and fish and wildlife management (USACE 1974b, 1982). The East Lynn Lake Project was authorized by the *Flood Control Act of 1938* (USACE 1974b, 1982). Construction of the East Lynn Lake Project was initiated in June 1965, and construction of the dam began in July 1968. Construction work on the dam was completed in April 1971. The permanent pool was filled during March 1972 and the seasonal pool level was reached on May 16, 1972 (USACE 1982).

The dam is a rolled earth fill dam. The dam has a height above streambed of 113 feet (133 feet total), a crest length of 652 feet, a top width of 32 feet and serves as a flood control facility along the East Fork of Twelvepole Creek and the Ohio River (USACE 1974b). The crest of the dam is at an elevation of 722 feet amsl, and the emergency spillway is at an elevation of 701 feet amsl (USACE 1982).

The lake is 12 miles long with 44 miles of shoreline. The summer pool elevation is typically 662 feet amsl, and the winter pool elevation is 656 feet amsl (USACE 2006a). The highest water elevation recorded to date at the lake is 684 feet amsl, 22 feet above the summer pool elevation. At summer pool elevation the surface area of the lake is 1,005 acres and the volume of water in the lake is 17,190 acre-feet. The storage capacity of East Lynn Lake is 82,500 acre-feet at a water surface elevation equal to the spillway elevation of 701 feet amsl (USACE 1974b).

The USACE established a minimum discharge flow of 10 cfs from the lake to prevent periodic low-flow conditions that occurred prior to construction of the lake (USACE 1974b). The stabilization of base flow in Twelvepole Creek has improved downstream water quality and ensures adequate water supply for the town of Wayne during periods of low rainfall. The town of Wayne uses Twelvepole Creek for intake of raw water and discharge of treated effluent.

Quantity–USACE (1974b) indicates that the East Fork of Twelvepole Creek had a normal average streamflow of about 152 cfs at the location of the East Lynn Dam without the reservoir project. The watershed area is about 139 square miles. The normal average streamflow reported by USACE (1974b) is equivalent to about 1.09 cfs per square mile of watershed. The total amount of runoff received from upstream of the lake was not changed by the reservoir project (USACE 1974b). With the exception of estimated evaporation losses averaging about 2,700 acre-feet per year, the total flow downstream of the dam also remained unchanged by the reservoir project. The evaporation losses are equal to 3.7 cfs, or about 0.03 cfs per square mile of watershed.

Surface water inflows to the lake may also be estimated based on information from the USGS gauge at Dunlow, West Virginia (station number 03206600). That gauge is located on the East Fork of Twelvepole Creek upstream of East Lynn Lake, with a drainage area of 38.5 square miles (USGS 2007). Average annual streamflow at that gauge for calendar years 1968 through 1981 was about 1.52 cfs per square mile. This would be equal to surface water inflow of about 212 cfs over the entire 139-square-mile watershed.

Surface water outflows from the lake may be estimated based on information from the USGS gauge at the East Fork of Twelvepole Creek below East Lynn Lake dam (station number 03206790). That gauge is located 800 feet downstream from Laurel Creek and 1,700 feet downstream from the dam. Average annual streamflow at that gauge for calendar years 1968 through 1981 was about 195 cfs, equivalent to 1.41 cfs per square mile of watershed.

The lake may either receive groundwater from surrounding aquifers, or discharge to those aquifers, depending on the difference between the lake level and groundwater elevations. USACE (1974b) indicates that changes in groundwater levels downstream of the dam had not been noted due to the reservoir project. The USACE further stated that project-related changes in groundwater were expected to be "imperceptible."

Current measurements of groundwater elevations compared to the lake level indicate that some sections of the lake may receive groundwater. Other sections may discharge water into the surrounding aquifers. The magnitude of the maximum likely loss from the lake to groundwater can be made with the following assumptions:

- The entire surface area of the lake (1,005 acres) is contributing flow to groundwater.
- Flow is vertically downward between the lake and an underlying aquifer that is hydraulically connected to the lake.
- The hydraulic gradient between the lake and the aquifer is equal to 1, representing gravity drainage from the lake into the aquifer.
- The vertical hydraulic conductivity of the lake bottom is equal to the highest estimated value for the rock units between coal seams, or 5.5×10^{-5} ft/day (vertical hydraulic conductivity is also addressed in section 3.3–Groundwater Resources and in appendix F).

Using these conservative assumptions and applying Darcy's Law, the calculated seepage from the lake to groundwater is no greater than 0.03 cfs. By comparison, this seepage is less than 1 percent of the estimated annual evaporation losses. This calculation supports the conclusion in USACE (1974b) that changes to groundwater conditions resulting from the impoundment of East Lynn Lake are minimal. Potential interactions between the lake and mine voids that would be created if the Proposed Action is selected and the RFDS is implemented are discussed in section 3.3.2c1 and appendix F.

Table 3.2-6 summarizes the estimated annual water balance for East Lynn Lake, based on data collected from 1968 through 1981, information reported in USACE (1974b) and the calculations described above.

Table 3.2-6
East Lynn Lake Water Balance

Flow Component	Inflow (cfs)	Outflow (cfs)
Surface Water Streams	212	195
Evaporation		3.7
Maximum Groundwater Seepage		0.03
Total	***212***	***199***
Percent Difference	*6% of Outflow*	

The difference between calculated inflows and outflows is about 6 percent of the outflow value. This difference is within the range of uncertainty that can be expected in the data measurements and calculations.

Quality–The WVDEP has designated East Lynn Lake as a category "C" water body, also known as a "Water Contact Recreation" water body. The criteria developed for category C water bodies are to protect human health from toxic effects through fish consumption (West Virginia *Code of State Rules* 47 CSR 2). While some of the existing activities in the vicinity of the proposed lease tracts may impact concentrations of the chemicals used as criteria to protect category C waters, the existing oil and gas and coal mining activities typically affect different parameters, including pH, total iron, total sulfate, TDS, and TSS.

Changes in water quality in the lake through time can be evaluated using available data. Surface water monitoring in East Lynn Lake is conducted by the USACE, the USGS, and the WVDEP. For this FLUA/FEIS, surface water specialists used temporal data from surface water sampling stations monitored by the USACE to determine water quality in East Lynn Lake. Table 3.2-7 lists the sampling stations, location descriptions, and the period of record for which the water quality of East Lynn Lake was evaluated. Station locations are shown on figure 3.2-2. These sampling locations were chosen based on period of record. Sampling at these locations is not mandatory and hence sporadic sampling events and data gaps are common.

Table 3.2-7
USACE East Lynn Lake Surface Water Monitoring Stations Used to Determine the Quality of East Lynn Lake

USACE Station ID	Location Description	Latitude	Longitude	Period of Record
ELT0001	~0.15 miles downstream from East Lynn Lake Dam	38° 8′ 43″	82° 22′ 58″	Apr 1980 – Aug 2006
ELT0002	~0.2 miles upstream from East Lynn Lake Dam	38° 8′ 31″	82° 23′ 12″	May 1981– Aug 2006
ELT0044	East Lynn Lake/East Fork of Twelvepole Creek at Kiahsville	38° 5′ 32″	82° 19′ 7″	Aug 1980– Aug 2006

Water quality parameters evaluated at the three stations listed in table 3.2-7 were assessed to evaluate changes over time. Parameters evaluated included, pH, iron, sulfate, TDS, and TSS.

For an overview, table 3.2-8 summarizes data from samples at one location in the lake collected by the USACE between 1981 and 2006 (Harlan 2007). Based on these sample results, the pH in the lake increased from approximately 6.5 in 1981 to 7.9 in 2006. Sulfate and TDS concentrations both increased from 1981 to 2006. Total iron concentrations decreased over the same time period. Water quality changes in the lake are likely due to some existing recreational activities and surface coal mining activities in the watershed upstream of the lake (REIC 2000-2006).

Table 3.2-8
Surface Water Quality in East Lynn Lake over Time
1981 versus 2006

Analyte	May 1, 1981	April 17, 2006
pH	6.4	7.9
Total Iron (mg/L)	0.206	0.095
Total Sulfate (mg/L)	17	67.8
TDS (mg/L)	42	121
TSS (mg/L)	<10	4

Sample location: station ELT0002 (Harlan 2007).

In 1994 monthly samples were taken from the lake to evaluate seasonal changes in water quality (Harlan 2007). Those data (table 3.2-9) show seasonal differences in concentrations of iron, sulfate, and TDS. Concentrations usually increase in the drier months as water in the lake evaporates and inflows decrease, and decrease in the wetter months when evaporation is less and inflows from streams are greater. Seasonal stratification and overturning of the lake may also contribute to differences in water quality over the course of a year.

Table 3.2-9
Surface Water Quality in East Lynn Lake over Seasons
April through November 1994

Date	pH	Total Iron (mg/L)	Total Sulfate (mg/L)	TDS (mg/L)	TSS (mg/L)
4/14/1994	6.9	0.702	15.9	70	8
5/16/1994	7.05	0.263	18.8	66	8
6/1/1994	6.9	0.102	24	104	3
6/16/1994	7.05	0.044	21.2	83	<1
6/29/1994	7.05	0.069	22.5	75	3
7/13/1994	7.1	0.035	23	60	1
7/26/1994	7.15	0.047	22	55	2
8/8/1994	7.4	0.052	21.1	86	1
8/25/1994	7.55	0.055	29.6	91	1
9/7/1994	7.1	0.064	30.1	76	2
9/22/1994	7.45	0.071	30	96	1
10/5/1994	7.1	0.106	32.4	102	2
10/18/1994	7.1	0.084	30.7	88	4
11/3/1994	7.1	0.167	29	85	2
11/16/1994	7.2	0.301	28.6	109	<1
11/29/1994	7.45	0.173	30.4	112	<1

Sample location: station ELT0002 (Harlan 2007)

3.2.1d3 Seeps and Springs

Little information has been collected about seeps and springs within the USACE East Lynn Lake Project area. A state-wide summary of spring information published by the West Virginia Department of Geology and Economic Survey (McColloch 1986) indicates that there are no documented springs in Wayne County. No local spring or seep surveys have been performed to date, other than the incidental data collected as part of other investigations.

A sulfur spring was identified in the streambed of Upper Laurel Creek during the 2001-2002 drought. The spring was located where the No. 5 Block coal seam occurs at the surface (MM&A 2005). Other springs may exist within the USACE East Lynn Lake Project. Seeps are visible along roadsides in the vicinity of the proposed lease tracts.

Quantity–Seeps and springs can be affected by precipitation, local geology, and human activities. Flow from shallow seeps and springs can be affected by seasonal or annual changes in the amount of precipitation in the area. Local geology provides a strong control on the location of seeps and springs, as well as the amount of water flowing from them. Springs have the potential to form at the contact of coal seams with the underlying shales and claystones (Hobba 1993).

Quality–Seeps and springs are areas where groundwater reaches the surface and can enter streams and lakes. With the exception of the sulfur spring described in the subsection above (Surface Water

Resources–Seeps and Springs), no springs or seeps with impaired water quality have been documented on the proposed lease tracts or on lands currently overlying underground mining operations.

3.2.1e Human Development

Numerous existing human activities have occurred or are occurring in the vicinity of the proposed lease tracts:

- homeowner activities
- recreational activities
- natural gas development
- underground and surface coal mining

Residential activities, recreational activities, and oil and natural gas activities typically have a greater potential to impact water quality rather than quantity.

3.2.1e1 Homeowner Activities

No permanent homes are located on the proposed lease tracts. More than 280 residential wells exist in the area surrounding the proposed lease tracts. The majority of these wells are located to the east of the proposed lease area (figure 3.3-1).

If a homeowner spills or releases a petroleum product or other chemical to the ground surface, that product could be washed into nearby surface waters. In contrast, if a stream is impacted, and the stream discharges into the local aquifer, that stream could impact the aquifer, and in turn impact a homeowner's well. Additional information on wells is presented in the section below (Groundwater Resources).

Individual sewage disposal facilities (ISDF) are also present in the vicinity of the study area, and are known to be potential sources of water quality impacts to receiving waters. However, tracing any particular water quality impact to a particular source is difficult.

3.2.1e2 Town of Wayne

The town of Wayne withdraws water from Twelvepole Creek for potable use at a point about one mile downstream of the confluence of the East Fork of Twelvepole Creek and the West Fork of Twelvepole Creek (Rice 2008). This location is about 11 river miles downstream of the East Lynn Lake dam.

3.2.1e3 Recreational Activities

Recreational activities occurring on the study area include hiking, mountain biking, hunting, and ORV use. A photograph of an area on the USACE East Lynn Lake Project impacted by ORV use is included in appendix C (photograph C-5). In addition to these activities, boating, fishing, and swimming occur in the vicinity of the study area.

Recreational activities–Existing Impacts–Streams–Mountain biking or illegal ORV use in streams can impact water quality directly by stirring up sediment as well as mobilizing any chemicals that might have been bound loosely to those sediments, thereby increasing TDS, TSS, and/or concentrations of chemicals such as metals in receiving streams. Recreational activities can also impact water indirectly by disturbing

vegetation and exposing soil anywhere within the watershed. Whenever vegetation is damaged and soil is exposed, the soil becomes more vulnerable to erosion. During subsequent rain events or during spring snowmelt, water flowing across the exposed surface may pick up more soil particles and any chemicals bound to those particles, contributing to the cumulative TDS, TSS, and chemical concentrations in the receiving water.

ORVs may release petroleum products directly into streams or may release petroleum products to soils that may eventually erode into streams. According to Wayne County Emergency Services personnel, no significant spills or releases have been reported in the vicinity of the proposed lease tracts since 1999 (Willis 2007b). Quantities of hazardous materials associated with ORV use are typically below the reporting quantities, and the potential for hazardous materials release or oil spills from these activities is expected to be low.

Recreational Activities–Existing Impacts–East Lynn Lake–Recreational activities that occur in and around the lake impact water quality. The recreational facilities include campgrounds and designated areas for boating, fishing, swimming, hiking and ORV use. The use of motorized boats on the lake can add petroleum products to the water. Foot or non-motorized vehicle traffic in or near campgrounds can destroy existing vegetation, leading to increased erosion and water quality impacts. Impacts to water quality can also result from ORV use in or near water bodies, which can cause an increase in suspended sediment. Improper disposal of trash and/or human waste in or near the lake also has the potential to impact water quality. In addition, spills of petroleum products directly to the lake or tributary streams can cause changes in surface water quality. Changes in water quality can impact fish and wildlife, as well as the people that use the lake for recreation and for drinking water at the East Fork Campground. As noted above under (Recreational Activities–Streams), no significant spills or releases have been reported in the vicinity of the proposed lease tracts since 1999 (Willis 2007b).

3.2.1e4 Oil and Gas Development

Historical and current oil and gas development activities include construction, operation, maintenance, and repair of oil and natural gas wells and associated facilities including drilling pads and mud pits, collection pipelines, compressor stations, oil storage tanks, natural gas storage tanks, produced-water storage tanks, and access roads.

Oil and Gas Development–Existing Impacts–Streams–These activities could cause compaction of soils and damage to vegetation, and in turn cause erosion and sedimentation. Eroded soils are washed into water resources and indirectly impact water resources by elevating TDS and TSS.

Spills or releases of petroleum products can impact surface waters, as well. Oil and gas companies have been operating development and collection facilities on the proposed lease tracts since at least the 1960s. According to USACE personnel, one spill associated with oil and gas development has occurred on the proposed lease tracts. In the 1980s, a fuel truck supplying an oil and gas facility overturned as it crossed over a creek bed. The USACE Project personnel responded to the spill and a contractor cleaned up the spill. Over the past two decades, state oversight of oil and gas development activities has increased, and housekeeping at oil and gas facilities has improved (Smith 2007a and Smith 2007l). This trend is expected to continue under the current management situation.

Oil and Gas Development –Existing Impacts–East Lynn Lake– Oil and natural gas wells are located within the USACE East Lynn Lake Project area (figure 3.1-10). Many of these wells are located on the proposed lease tracts. Historical and on-going activities associated with oil and natural gas wells include construction of drill pads and mud pits, compressor stations, pipelines, oil, gas, and water storage tank pads, and access roads. These activities directly impact vegetation and soils, leading to erosion and indirect impacts to receiving waters. Water is often produced along with the oil and/or natural gas. This water is often referred to as brine and can contain very high amounts of TDS. If this produced water were discharged to the surface and reached streams or the lake, the water quality of those receiving waters could be impacted. Operation and maintenance of the oil and gas wells requires use of fuel, lubricants and other chemicals. Spills or releases of these materials could impact surface water quality. No available data document that oil and natural gas well activities impact the lake.

3.2.1e5 Coal Mining

Underground and surface coal mining, including shallow "house mining," has been occurring in the vicinity of the proposed lease tracts for more than a century. As part of mine planning and design, the Applicants establish protection zones in the vicinity of structures, including streams, by calculating the angle of draw (figure 3.1-14).

Coal Mining–Existing Impacts–Streams

Quantity–Underground coal mines can affect stream flows by inducing settling, or subsidence, beneath or next to a stream. Subsidence can cause cracks in the ground that absorb water from a stream and reduce the associated flow at the surface. Underground coal mines can also increase stream flows by discharging water from permitted dewatering and refuse facilities. Dewatering of underground coal mines can also affect stream flows; because the water removed from the underground mine is usually discharged to the nearby streams. Impacts of underground mining, primarily in the No. 5 Block seam, on stream flow were observed in Laurel Creek during the drought in 2001-2002 (MM&A 2005).

Surface coal mining can affect stream flows by withdrawing water or by adding water from permitted discharges. Surface coal mines can also alter the runoff characteristics of the land surface, which can change the amount of water entering a stream during rainfall events.

Quality–A common issue related to water quality and coal mining is the formation of acid mine drainage (AMD). Laboratory analyses from the Coalburg/Winifrede seam and subsequent analyses by both Rockspring and Argus suggest that the acid-generating potential of the coal is limited (MM&A, n.d. Attachment J-6, Table J-6.1; and Argus 1999, Attachment I-9). As described in section 3.3 (Groundwater Resources), groundwater resource specialists used available data from the existing and reclaimed Rockspring or Argus mines associated with the Coalburg/Winifrede seam to perform an independent analysis (appendix G) for this FLUA/FEIS. Overall, the data and analyses indicate that the majority of the materials are classified as uncertain or potentially acid generating (EPA 1994, ADTI 2000). However, the methodology used is dependent upon total sulfur values, and the sulfur is not typically in the form of sulfide (for example, pyritic sulfur). Consequently, the analysis is conservative. In addition, water chemistry data from Rockspring's existing Camp Creek Mine is relatively good, and the pH of the water, the primary indicator of acidity, is neutral.

Surface mining, especially of the No. 5 Block coal seam, can affect water quality in streams. The No. 5 Block seam is known to contain more sulfur than the deeper Coalburg/Winifrede seam. This sulfur can increase the sulfate concentration in streams, and can also make the water more acidic when pyritic sulfur oxidizes. Water quality in creeks upstream of the lake may be influenced by surface mining-related activities, as noted in the subsection above (Affected Environment). However, tying impacts to one specific source is difficult.

Discharges from permitted coal processing and waste storage facilities associated with underground and surface mines can also affect water quality in streams by contributing solids and dissolved chemicals. These discharges can increase the TDS, TSS, acidity, and/or concentrations of chemicals of the receiving stream.

Coal Mining–Existing Impacts–East Lynn Lake

Quantity–Underground coal mines located in the vicinity of the lake could impact water quantity in the lake. If an underground mine operator mined into a water-bearing formation, that operator may pump that water out of the mine to keep the mine relatively dry. If the water-bearing formation were connected to the lake, the pumping could impact water discharge rates from the lake. The quantities of water reportedly being pumped by the operators of the existing underground mines on adjoining properties (Saunders 2008, Maggard 2008) indicate that neither mine has intercepted a water-bearing formation that is connected with the lake.

Mining beneath the lake would have the largest probability of impacting water quantities in the lake. However, the RFDS specifically excludes mining beneath the lake or within 200 horizontal feet of the spillway elevation. This 200-ft horizontal barrier is based on the 1977 USBM Information Circular 8741 on mining near surface and underground bodies of water (Babcock and Hooker 1977).

Similarly, surface coal mines located in the vicinity of the lake can impact the quantity and/or quality of water in the lake. If surface mine operators dig into rock that is a water-bearing formation, the water may begin to collect in their mining operation, and they may pump that groundwater out of the mine to keep the mine dry. The water would be discharged into the closest stream, which would flow to the lake. That pumping can change the water balance in the watershed. Again, based on available information, existing surface mines in the vicinity of the proposed lease tracts have not impacted water quantity in the lake to a measurable degree (Maggard 2008).

Quality–Existing underground mine openings can have an impact on water quality in the lake. The chemical properties of groundwater flowing into mine openings can change as any chemicals used in mining or any naturally-occurring minerals dissolve into the water. The groundwater may discharge locally to streams that flow into the lake. However, as noted above, tracing any particular water quality impact to a particular source is difficult. No available data document that underground mining activities impact the lake.

Surface coal mines can impact the quality of water in the lake. As described above, if surface mine operators dig into rock that is a water-bearing formation, mine operators may pump any groundwater flowing into a mine out of the mine to keep the mine dry. That pumping can change the quality of the water because the pumped water may pick up dissolved minerals and silt, clay, or other particles, which would cause TDS and TSS values to increase. Water that contacts the surface mining operations may

later flow into the lake, carrying with it any increased TDS and TSS. Mining companies must comply with existing federal and state regulations and requirements to minimize impacts to water quality.

Coal Mining–Existing Impacts–Seeps and Springs

Quantity–Underground coal mining can affect seeps and springs. The underground voids left after removing the coal can alter the flow and quality of groundwater that enters the voids. Groundwater that has entered the underground voids may eventually discharge to the surface as a spring or seep. Surface mining also can affect the quantity of water which reports to seeps and springs. Water discharges from permitted surface facilities can enter shallow aquifers, then re-surface in nearby seeps or springs.

Quality–Sulfur contained in coal can become dissolved in groundwater and form sulfate compounds, thereby increasing overall sulfate concentrations in groundwater. Sulfur can also make the water more acidic when pyritic sulfur oxidizes. Discharges from permitted facilities associated with surface mines can also affect groundwater quality by contributing TDS or concentrations of chemicals.

When these discharges flow into streams or infiltrate into rock formations that are in communication with perched aquifers, these discharges can subsequently report to seeps and springs. Seeps and springs can also be affected by active and abandoned underground mines. The underground voids left after removing the coal can result in a change in flow and quality of groundwater within the mine openings. Water flowing through these voids may dissolve chemicals or pick up solids present in the exposed surfaces of the void. This water may discharge to the surface in the form of a spring or seep.

3.2.1e6 Legal and Illegal Logging

Legal logging operations must comply with state and federal regulations, and the occurrence of releases or spills is expected to be low. Small-scale illegal logging has occurred occasionally on the proposed lease tracts. Quantities of hazardous materials associated with small-scale logging are typically below the reporting quantities, and the occurrence of hazardous materials release or oil spills is expected to be low.

3.2.1f Summary

On-going activities on or in the vicinity of the study area are expected to continue into the future. Any impacts to water quantity or quality due to these activities are expected to continue at approximately the current level. If these activities are expanded or new activities are initiated, negative impacts to surface water quantity and/or quality may increase, depending on the nature of the new or expanded activities.

3.2.2 Environmental Consequences

3.2.2a Scoping Issues

Issues related to surface water resources that were identified during scoping include:

- surface water quality and quantity,
- flood control,
- acid mine drainage,

- seeps and springs,
- documentation and citizen education,
- hydrologic balance issues associated with underground mining,
- long-term adequacy of mine barriers/seals,
- mining buffers for streams,
- feeder stream quality, and
- post-mining impacts of water seepage.

3.2.2b Significance Criteria

To determine the significance of impact to a resource, the users of that resource must be identified. The proposed lease tracts are situated within the USACE's East Lynn Lake Project area, which was developed to provide recreation opportunities and flood control. In addition, the WVDNR holds a license to operate a wildlife management area on the majority of the USACE East Lynn Lake Project, with the purpose of maintaining suitable wildlife habitat.

No homes are located on the proposed lease tracts, and no regular or permanent human users are present within the proposed lease area. However, the town of Wayne's potable-water intake is located about 11 miles downstream of the East Lynn Lake dam. People served by the town of Wayne's water system are therefore users of the affected surface-water resource. The WVDNR is a regular or permanent user in maintaining vegetation on the surface of the proposed lease tracts that serves as desired wildlife habitat. Fish and other aquatic life in the streams and nearby lake, along with the wildlife present on and near the proposed lease tracts, also are regular or permanent users. The USACE's East Lynn Lake Project staff, and visitors who come to boat, fish, or enjoy the scenery are frequent, periodic, or temporary users of the streams on the proposed lease tracts and nearby lake. Recreation facilities are shown on figure 3.12-1.

The significance criteria for impacts to surface water quantity are:

- a sustained drop in water flow in the streams crossing the proposed lease tracts that would negatively impact the fish or wildlife that use those streams, and/or
- a sustained drop in water level in East Lynn Lake that would negatively impact the existing uses of the lake.

The significance criteria for surface water quality are:

- an exceedance of WVDEP surface water standards, including applicable anti-degradation standards, and/or
- degradation of water quality in any one of the streams crossing the proposed lease tracts to a point where the stream is placed on the WVDEP 303(d) list.

3.2.2c Impacts–Proposed Action (Preferred Alternative)

If the Proposed Action is selected and the coal mining RFDS is implemented, the existing underground mining operations in the Coalburg/Winifrede coal seam would be extended into the federal coal under the proposed lease tracts. The RFDS (appendix B) describes specific limits that would be applied to the lease:

- Approximately half of the federal coal would be left in place to form pillars supporting the roofs of the mines to prevent subsidence.
- No mining would occur within 100 vertical feet of the surface.
- No mining would occur within 150 horizontal feet of any point where the coal seam outcrops at the surface.
- No mining would occur within a minimum of 200 horizontal feet of the high water line of the lake shore. While this width may be expanded during the mine planning and permitting process, the 200-ft barrier is on based the 1977 USBM Information Circular 8741 on mining near surface and underground bodies of water (Babcock and Hooker 1977).
- No mining would occur under the lake.
- Minimal mining is planned under perennial streams; where small entries may be mined to maintain ventilation or access, best management practices would be implemented and federal and state guidance would be followed to protect the stream. The entries would be designed to allow for sufficient air flow and to prevent subsidence. A low percentage of coal (that is, 20 percent) would be removed.

On-going activities on the surface of the proposed lease tracts, including ORV use and oil and gas development, would continue under the Proposed Action and RFDS. These impacts are assessed in chapter 4 (Cumulative Effects).

3.2.2c1 Impacts–Proposed Action–Surface Water Quantity

If the Proposed Action is selected and the coal mining RFDS is implemented, minimal subsidence is expected, as described in section 3.1 (Geology and Minerals) above. In the absence of subsidence, the proposed mining operations are not expected to impact water quantities in surface water resources on or near the proposed lease tracts. Appropriate monitoring programs to evaluate water-quantity impacts would be considered during the mine-planning and permitting process if the Proposed Action is selected and the RFDS occurs.

The proposed mining is not expected to enhance any connection between the coal seam and the shallow groundwater systems that are connected to streams, and surface water resources should not be affected. For this FLUA/FEIS, groundwater resource specialists calculated potential seepage under the RFDS (section 3.2.2c1). Based on their calculations, the mined out voids may fill up over 50 years after mining is completed and water may seep through the coal barrier laterally along portions of the drainage. This proposed scenario is shown in a cross-sectional drawing in appendix F (figure F-2), and the predicted seepage rate across the barrier is shown in a table in that appendix.

The required low-flow release of 10 cfs from the East Lynn Lake dam is not expected to be impacted by the Proposed Action and RFDS. No impacts are anticipated to the quantity of water available to downstream users including the town of Wayne.

3.2.2c2 Impacts–Proposed Action–Surface Water Quality

Potential impacts to surface water quality from mining activity can include increases in TDS and other chemicals as a result of sediment loading or seepage. Under the Proposed Action and RFDS, minimal surface disturbance is proposed (appendix B).

Coal extracted from beneath the proposed lease tracts would be processed at existing facilities, resulting in no changes from existing discharges to surface streams. However, the operational time frame of the existing facilities may be extended. Continued compliance with permit conditions governing surface-water discharges from these facilities is expected.

Existing surface mining operations would not be affected by the Proposed Action or RFDS. Sediment loading is not a foreseeable impact by mining since surface disturbances are not planned. No significant impacts to surface water quality due to the underground operations and continued coal processing are expected if the Proposed Action and coal-mining RFDS are implemented.

No significant impacts to surface water quality due to seepage through outcrop barriers have been documented in existing underground operations. Based on this observation and expected similar conditions under the Proposed Action and RFDS, no significant impacts to surface water quality are expected due to seepage through the proposed outcrop barriers.

If proposed mining is performed, a system of open “rooms” and coal pillars would remain after the coal has been removed. The rooms may eventually fill with water and re-equilibrate with the groundwater systems above and below the Coalburg/Winifrede seam. Based on available information presented in section 3.3 (Groundwater Resources) and appendix G, the water quality in the Coalburg/Winifrede seam is predicted to be of good quality, unlike that of the No. 5 Block coal seam. Acid mine drainage has not been observed in existing underground operations extracting coal from the Coalburg/Winifrede seam, and the quality of water accumulating in the closed portions of the mine is good. Therefore, any groundwater that would accumulate in the proposed mine voids is not expected to impact surface water upon discharging to the surface. No significant impacts are expected to water quality in seeps and springs.

No significant water-quality impacts to downstream surface-water users are expected. The town of Wayne’s water-supply intake is located about one mile below the confluence of the East Fork of Twelvepole Creek and the West Fork of Twelvepole Creek. Based on watershed areas provided by Wilson (1979) the area of the watershed above Laurel Creek is about 48 percent of the watershed area above the intake for the town of Wayne’s water supply. Any water-quality impacts that may occur within the East Lynn Lake watershed, although not expected to be significant, would be diluted by the additional water contributed by the watershed areas downstream of the lake and the entire watershed area of the West Fork of Twelvepole Creek before reaching the town of Wayne’s water intake.

3.2.2d Impacts–No Action

The No Action Alternative is to not lease the federal coal. The federal coal would remain in place and would not be mined. The USACE would continue to manage activities on the surface of the proposed lease tracts for flood control, recreation, and fisheries. The WVDNR would continue to manage the surface of the tracts for timber, recreation and wildlife.

The owners of the oil and gas estate could continue to produce from existing wells and would be able to drill additional wells to increase production. Continued oil and gas drilling would likely open up additional avenues of access into the USACE East Lynn Lake Project lands. This increased access could lead to additional illegal timber harvesting and illegal ORV use.

The existing, operating mines would continue to extract and process private coal from lands that lie next to the proposed lease tracts using their existing underground and surface facilities. The opportunity would exist to lease and mine the federal coal in the future, although physical and legal access to the coal would probably be limited as a result of the continued mining of the private coal at the two existing mining operations.

Impacts to surface water quantity under the No Action Alternative would likely be similar to existing conditions. No changes in streamflow or the amount of water stored in East Lynn Lake would be expected as a result of implementing the No Action Alternative.

Impacts to surface water quality under the No Action Alternative would likely be similar to existing conditions. Existing water quality would likely continue into the future.

3.2.2e Mitigation Measures

No mitigation measures are required because no significant impacts are expected under either the Proposed Action or the No Action Alternative.

3.2.2f Residual Impacts

No significant impacts are expected under either the Proposed Action or the No Action Alternative. Therefore, no residual impacts are expected.

3.2.2g Monitoring Recommendations

No monitoring recommendations are required because no significant impacts are expected under either the Proposed Action or the No Action Alternative. If the Proposed Action is selected and the RFDS is implemented, monitoring of surface water quantity and quality would be conducted in accordance with applicable permit conditions.

3.3 GROUNDWATER RESOURCES

A groundwater body–or groundwater resource–forms in places where water soaks into the ground and collects in the geologic formation. Groundwater resources are often described based on their host geologic formation or group of formations. One type of groundwater resource is an aquifer. By definition, an aquifer is a formation that is saturated and permeable enough to transmit economic amounts of water to wells and/or springs. Depending on the nature of the geologic units, a groundwater body may or may not be classified as an aquifer.

Groundwater resources are also described in terms of quantity and quality. When describing groundwater quantity, groundwater specialists often describe the rate at which water flows down through rock layers. They refer to this rate as "vertical hydraulic conductivity" and sometimes as "permeability." Hydraulic conductivity is measured in units of ft/day or cm/sec, and indicates the ability of a groundwater system to transmit water.

Groundwater quality is often described by examining chemical properties of the water. Chemical properties include:

- acidity measured in pH units,
- the capacity of solutes in an aqueous system to neutralize acid, known as alkalinity and measured in milligrams per liter (mg/L), and
- concentrations of chemicals such as iron and sulfate, which are typically measured in mg/L.

Physical properties include the amount of dissolved minerals and silt, clay, or other particles, referred to as total dissolved solids (TDS), which is measured in mg/L. Biological properties include the amount of dissolved oxygen (DO) in the water measured in mg/L.

The users or potential users of a resource include active or passive recipients of the resource, along with those whose actions may impact the resource. People often use groundwater resources as sources of drinking water. Some plants rely on groundwater. To meet the needs or requirements of these groundwater users, regulatory agencies have established standards for water quality.

Naturally-occurring conditions can affect water quality. For example, groundwater stored in mineral-rich rock may dissolve the minerals present in the rock. Human development, such as residential well installation or coal mining, also can contribute chemicals to groundwater. To determine if groundwater has been impacted, water specialists often compare pH, alkalinity, and concentrations of different chemicals, especially metals, found in a groundwater sample to water quality standards. If either groundwater quantity or quality is impacted, other resources such as vegetation, wildlife, or socioeconomics in the form of human health can be impacted.

3.3.1 Affected Environment

The groundwater resources study area for this FLUA/FEIS is all of the area within the outer boundary of the proposed lease tracts, and includes the stream corridors in between each of the lease tracts. The proposed lease tracts are located in the East Fork of Twelvepole Creek watershed (figure 3.3-1). Little information is available for the groundwater resources under the proposed lease tracts, but for several decades Argus and Rockspring have collected information on the groundwater resources under the

adjoining private properties in order to evaluate potential impacts to groundwater as a result of proposed mining under those properties. These comprehensive evaluations, known as probable hydrologic consequences (PHC) evaluations, must be submitted as part of the state's underground mine operations permit application process. Data submitted for these permits have been used in preparing this FLUA/FEIS.

3.3.1a Geologic Formations and Aquifers

As described in section 3.1.1 (Geologic and Mineral Resources), rock formations in the vicinity of the proposed lease tracts include sandstones, shales, coals, and some clays. Two commercially mineable coal seams are found in the area: the No. 5 Block and the Coalburg/Winifrede. The RFDS would involve mining the Coalburg/Winifrede seam.

The elevation of both the land surface and the Coalburg/Winifrede coal seam vary across the area surrounding the proposed lease tracts. Where the seam is visible at the surface, it is said to "outcrop" or to be "an outcrop." These outcrops are typically visible on the slopes in the stream valleys, also referred to as drainages or hollows. The depth of the seam ranges from zero to 750 feet below ground surface. The rock that lies over the coal seam is referred to as overburden. Based on available detailed contour information, the average overburden thickness is approximately 350 feet.

In the vicinity of the proposed lease tracts, the rock in the overburden is comprised primarily of sandstones, shales and fireclays, and an occasional coal seam (figure 3.1-3). The Upper Coalburg Sandstone typically lies immediately above the Coalburg coal seam. Layers of shale and fireclay are sometimes found within, or are "interbedded within," the Upper Coalburg Sandstone. Shales and mudstones typically have low vertical hydraulic conductivities. Based on laboratory data and observed infilling rates at Rockspring's and Argus' existing facilities near the proposed lease tracts, flow through the overburden is very limited. The low-permeability rock layers limit the vertical drainage of water from the shallow groundwater zones downward to the Coalburg/Winifrede coal seam. As noted in section 3.1 (Geology and Mineral Resources), thin underclays usually lie under the Coalburg/Winifrede seam. Shales and fireclay layers also tend to exist above and below the Upper Coalburg Sandstone. These fine-grained strata tend to form relatively impermeable barriers to the vertical migration of groundwater.

Several types of aquifers exist in the study area:

- ***Perched groundwater*** collects above low-permeability lenses or in fractured rock masses that are disconnected from the groundwater system. Perched groundwater bodies rely on infiltration of rainwater for replenishment, and therefore do not provide a significant, sustainable yield.
- ***Alluvial groundwater*** is found in the sediments in valley floors, and is typically in hydraulic communication with a surface stream.
- A ***stress-relief fracture zone*** is a type of aquifer found in zones of fractured bedrock immediately beneath alluvial groundwater systems. The upper portion of the bedrock is fractured as a result of physical weathering. The frequency of fractures typically decreases with depth, and less water is present with depth in fractured systems. Stress-relief fracture zones are constrained to the valleys and valley floors.

- Groundwater also occurs in ***deeper bedrock formations***. The characteristics of the host geologic formations determine the characteristics of the aquifer.

Seasonal and annual changes in precipitation result in naturally-occurring fluctuations in water levels in shallow aquifers. Longer lasting fluctuations can be the result of naturally occurring conditions such as droughts, or a result of human development activities. Numerous existing human activities may impact the quantity or quality of groundwater resources. However, tracing any particular impact to a particular source can be difficult. For example, some water quality parameters can be impacted by naturally-occurring conditions or by animal activity.

3.3.1b Groundwater Users and Uses

3.3.1b1 Groundwater Users and Uses–Study Area

The proposed lease tracts are located within an area established and managed by government agencies to provide recreation opportunities, flood control, and suitable wildlife habitat. No residents live on the proposed lease tracts, and no other regular or permanent human users are present within the proposed lease area. No groundwater wells for domestic supply have been constructed, so no data on groundwater immediately below the lease tracts has been collected or analyzed. Little information is available about the quantity or quality of groundwater that lies under the proposed lease tracts.

3.3.1b2 Groundwater Users and Uses–USACE East Lynn Lake Project

Humans–On the USACE East Lynn Lake Project, active users of groundwater resources include USACE staff and visitors who use drinking water produced by the following two wells at the USACE East Lynn Lake Project (figure 3.3-1):

- ***One well located at the Lakeside facility*** produces 12 gallons per minute (gpm) (Scragg 2007). The well provides water to the nearby recreation facilities, two restrooms, the marina, and the marina owner's home, which is typically occupied from May to October (Osborne 2007).
- ***One well located at the Lick Creek facility*** produces 18 gallons per minute (gpm) (Scragg 2007). The well provides water to the nearby recreation facilities, one restroom, and one shelter.

Previously, a third well existed at the East Fork Campground. About two years ago, the USACE decommissioned this well and installed a raw water intake to collect surface water from the lake, transport it to the East Fork water treatment plant, and provide water to the East Fork campground. Currently, the water produced by the two USACE wells is tested quarterly for coliform content. To date, coliform has not been reported in the samples (Osborne 2007).

Plants–In general, plants that are located near water bodies and are influenced by groundwater or surface water associated with that water body are considered riparian vegetation (figure 3.5-2). These plants depend on a consistent level of groundwater within reach of their roots, a zone of water known as the phreatic zone. If the phreatic zone drops below the reach of the plants' roots for a prolonged period, or if water quality declines for an extended period, then these plants would be significantly impacted, and the animals that depend on the plants could be indirectly impacted. Riparian vegetation is a regular or permanent groundwater "user" on the proposed lease tracts and throughout the region.

3.3.1b3 Groundwater Users and Uses–Surrounding Area

Homeowners–Homeowners are the predominant users of groundwater resources in the vicinity of the proposed lease tracts. Most homeowners in the region surrounding the study area have dug their wells, mainly by hand, in the saturated alluvium. Other groundwater resources in the vicinity include low-yielding perched aquifers. Groundwater withdrawal through residential wells can reduce groundwater quantity by lowering the local groundwater level.

Homeowners near the study area also operate individual sewage disposal facilities (ISDF). Operation of ISDFs can impact groundwater quality by returning water containing biological or chemical contaminants to the shallow aquifers.

Water Quantity–More than 280 residential wells exist in the area surrounding the proposed lease tracts. The majority of these wells are located to the east of the proposed lease area. A summary of these wells that have been monitored is available in the previous operations permit applications compiled by Rockspring (Rockspring 2004) and in the *Application for Competitive Lease* data provided by P&A Engineers and Consultants (P&A 1999).

Most of the wells in the vicinity of the lease tracts are completed to depths of approximately 75 feet, with very few greater than 100 feet in depth. The majority of these wells are completed into shallow water-bearing units that include the saturated alluvial sediments, or into the stress-relief fracture zone in shallow bedrock. The alluvium rests above the bedrock and is typically connected to the surface streams in the valley floors. The fractures in the stress-relief fracture zone decrease with depth. Fractures typically extend to 50 to 60 feet bgs (Blackburn 1997), and have been reported to extend to roughly 120 feet (P&A 1999). A site-specific study of the stress-relief zone has not been conducted in the valleys adjacent to the lake, so the true depth of the stress-relief zone is not clearly defined. The depth of residential wells can be used as an indicator of the depth of the stress-relief fracture zone. Well drillers tend to drill to depths of about 75 to 100 feet to exploit fractured rock for water production, so it is reasonable to bracket the depth at less than 150 feet. However, no clear definition of the depth has been defined.

In the summer of 2000, a few local residents registered complaints regarding loss of water in their wells. The residents lived within the Laurel Creek drainage and near the existing Rockspring mining operations. MM&A (2005) performed follow-up studies and concluded that lowering of the water table and its associated impact on shallow wells was the result of a drought period that extended from 1998 into 2001.

Three residential wells are known to penetrate the Winifrede coal seam. Of the three wells, two are located on the Right Fork of Lick Creek, near the valley floor. These wells may be completed in the stress relief fracture zone. These two wells are both approximately 65 feet deep, and to date the wells have not suffered any apparent impact from mining in the area. The third well is located farther to the north on Laurel Creek, and was reported by Rockspring to have had a reasonable yield, but less than ideal water quality (Barton 2007d). Outside of the Laurel Creek drainage, the specialists are unaware of decreases in water levels in residential wells resulting from underground mining.

Water Quality– In 2002, Rockspring collected and analyzed groundwater samples from hand-dug residential wells located near several of the company's permitted mining areas (MM&A 2002). Results of these analyses are summarized in table 3.3-1. Generally, these hand-dug wells are 15 to 50 feet deep and collect water from the alluvial aquifers for residential use.

Table 3.3-1
Summary of Groundwater Quality in Hand-Dug Wells

Analyte	Concentration Range	USEPA Secondary MCL
pH	4.35–8.33	6.5 to 8.5
Total Iron	<0.05–19.9 mg/L	0.3 mg/L
Total Manganese	< 0.02–1.21 mg/L	0.05 mg/L
Total Aluminum	< 0.04–1.5 mg/L	0.05 to 0.2 mg/L
TDS	26–502 mg/L	500 mg/L

Notes: No primary MCLs exist for any of the analytes listed in this table.
mg/L–milligrams per liter
MCL–maximum contaminant level
Sources: chemical values: MM&A. 2002.
MCL values: USEPA. 2007g.

Drilled residential wells typically penetrate the stress-relief fracture zone immediately below the alluvium. These wells range in depth from 50 to 115 feet below ground surface. Most wells are drilled to a depth of 75 feet deep or less. The wells typically have poor water quality due to high iron concentrations. Typically, total iron concentrations exceed 1.0 mg/L in groundwater in the stress-relief fracture aquifer, and commonly exceed 10 mg/L. Based on the data collected by Rockspring, naturally-occurring concentrations of total iron in the stress-relief fracture zone range from less than 0.05 (<0.05) mg/L to 33.6 mg/L. Iron concentrations may tend to be higher in the deeper wells completed in the stress-relief zone, as opposed to the hand dug wells. The USEPA secondary maximum contaminant level (SMCL) for total iron is 0.3 mg/L (USEPA 2007g). Some of these wells are located on Cove Creek adjacent to Rockspring's Ben Haley operation, in operation since 2001, and Argus' Pigpen Branch No. 7 Deep Mine, in operation since 1998. The sulfate levels in the residential wells are generally low, but tend to be higher in the hand-dug wells.

Oil and Gas Development–Several oil and natural gas companies are developing natural gas resources on the proposed lease tracts, as well as in the surrounding area. Natural gas is typically withdrawn from formations deeper than the aquifers lying under the proposed lease tracts. These gas well activities may impact groundwater. Existing natural gas production activities such as drilling through aquifers, failure of well equipment, release of oil, or release of produced water that typically contains elevated levels of TDS may result in reduction in groundwater quantity or impairment of groundwater quality through the creation of conduits to the surface or to other stratigraphic units.

No existing impacts to groundwater resources related to oil and gas activities on the proposed lease tracts have been identified.

Coal Mining Operations–Underground and surface coal mining, including shallow "house mining," has been occurring in the vicinity of the proposed lease tracts for more than a century.

Underground Mines–Abandoned underground coal mines could impact groundwater quantity and quality. Groundwater in the rock layers that lie above or below the coal seam can enter abandoned underground

mines. As water flows into an abandoned underground mine, minerals can dissolve into the water, changing its groundwater quality. Unsupported sections of roof can collapse and cause fracturing or subsidence of the rock that lies over an abandoned underground mine. Fracturing or subsidence can change the groundwater flow path, and can create a potential pathway for water to flow from formations above the mine into the mine. To minimize development of these conditions, mining companies analyze geotechnical and hydrologic conditions during mine planning and permitting, in compliance with federal and state regulations and guidelines.

Figure 3.1-12 shows abandoned mine lands mapped by WVAMLR, and figure 3.1-13 shows abandoned commercial mines in the No. 5 Block seam in the vicinity of the study area. While several abandoned mines in the No. 5 Block seam are within one mile of the proposed lease tract boundary, none of the WVAMLR mapped abandoned mines are located within one mile of the proposed lease tracts.

Permitted underground coal mines have been operating on private lands adjoining the proposed lease tracts for several decades. To address safety concerns, the mine operators have been using "first-mining only," or 50 percent extraction room-and-pillar mining methods (figure 2.1-1). This method removes approximately 50 percent of the coal and leaves the other 50 percent in pillars that hold up the roof of the mine. What remains after mining is a system of open "rooms" and coal pillars. Over time, the rooms can begin to fill with water. During active mining, the water is pumped out of the mine. At Rockspring's Camp Creek facility, water collects very slowly. Occasionally, they pump the water out of the mine and into their processing system (Saunders 2008a or b). Water collects very slowly in Argus' facilities also. Occasionally, they pump the water out of the mine and discharge the water at regulated National Discharge Pollutant System (NPDES) points that are monitored for water quality (Maggard 2008). After mining is completed and the mine is closed in accordance with federal and state regulations, the rooms potentially fill with water and re-equilibrate with the groundwater systems above and below the coal seam.

Underground Mines–*Water Quantity*–As described in the subsection above (Affected Environment), shales and fireclays lie over the Coalburg/Winifrede seam. These numerous layers of rock have low vertical hydraulic conductivities, or permeabilities that limit downward migration of water through the overburden, and greatly limit drainage of water into the existing mines.

The vertical hydraulic conductivity data provided in table 3.3-2 below are averaged values based on samples taken from the overburden on Rockspring's currently permitted areas covered by Modification Nos. 1, 2, and 9 (MM&A 2001, MM&A 2002). The Upper Coalburg Sandstone lies over the coal seam. This sandstone is interbedded with shales, sandy shale units, and fireclays. The values of hydraulic conductivity for these shales, sandy shales, and fireclays are considered very low from a hydrologic perspective (table 3.3-2). The values for the sandstone units are higher, as expected, but still much too low to be considered prolific from a water production standpoint. It is therefore reasonable to expect that inflow of water to the Coalburg/Winifrede seam following mining is limited, except where there is localized and unforeseen fracturing.

Table 3.3-2
Mean Vertical Hydraulic Conductivity Values
Coalburg/Winifrede Coal Seam Overburden
Rockspring Modification Nos. 1, 2 and 9

Hydrogeologic Unit Above Coalburg/Winifrede Coal Seam	Mean Vertical Hydraulic Conductivity (ft/day)
Sandstone	5.5×10^{-5}
Sandy Shale	3.7×10^{-7}
Shale	1.1×10^{-8}

Source: MM&A 2001

Another parameter that controls the water flow in and out of voids after mining is the horizontal hydraulic conductivity (K_h) of the coal barrier. The Applicants have presented values of K_h in the probable hydrologic consequences (PHCs) included as part of their operations permit applications. The value presented by Rockspring ranges from 0.01 to 0.1 ft/day, while the value used by Argus in their discussion of seepage estimates is 1 ft/day. Other values generated from study of in-place coal barriers in underground mines in the Pittsburg seam indicate numbers that range from 0.08 to 1.1 ft/day (McCoy, Donovan and Leavitt 2006). These values are presented in table 3.3-3.

Table 3.3-3
Values of Horizontal Hydraulic Conductivity for Coal Units

Range of Horizontal Hydraulic Conductivity, K_h (ft/day)	Source	
0.01 to 0.1	Rockspring data	Numbers based on inflow rates to Camp Creek Mine. Attachment J-11.1, Modification Area No. 2 (MM&A 2001)
1.0	Argus data	Attachment J-6 of Application for Competitive Lease (P&A 1999)
0.12–0.59	MDL 2006	Isotropic Model–Pittsburg Coal Basin
0.24–1.1	MDL 2006	Face Cleat Anisotropy Model–Pittsburg Coal Basin
0.072–0.32	MDL 2006	Butt Cleat Anisotropy Model–Pittsburg Coal Basin

Notes: MDL= McCoy, Donovan and Leavitt
MM&A=Marshall Miller and Associates
P&A=P&A Engineers and Consultants

Infilling rates represent a combination of vertical inflow of water through the roof and floor of the mine, and lateral inflow through the coal barrier. Infilling rates for Rockspring's existing Camp Creek Mine opening have been documented at 0.01 to 0.02 gpm per mined acre (gpm/acre) (attachment J-5 in MM&A 2001). For Argus' facilities, Pen Coal Corporation, the previous owner, presented a mine infiltration calculation that used an infilling rate of approximately 0.003 gpm/acre (attachment I-9G in P&A 1999).

One other parameter that controls how much water will flow across a barrier in a given period of time is the hydraulic head that builds up behind the coal barrier. This hydraulic head can be thought of as a "driving head"; the greater the hydraulic head, the more water will flow through the coal barrier.

Water that flows through a barrier and discharges to the surface can be referred to as seepage. Rockspring estimated the lateral seepage rate out of the Winifrede coal at 0.24 gpm for every 100 horizontal feet of outcrop. Argus completed outcrop seepage calculations and their estimates range from 1.0 to 4.8 gpm for every 100 horizontal feet of outcrop (attachment J-6 in P&A 1999).

Another useful observation was made in the Camp Creek Mine, in an area where a sealed, flooded, abandoned portion of the mine is adjacent to an active mining operation. The inactive and active mines were separated by a coal barrier that varied from 80 to 130 feet in width. On the dry side of the mine where the barrier was 80 feet wide, there was detectable wetness from the floor to 3.5 feet above the floor. Where the barrier was 130 feet wide, the rib (that is, wall) of the active mine remained dry (MM&A 2005).

In October 2006, resource specialists preparing this FLUA/FEIS toured Rockspring's existing Ben Haley underground room-and-pillar mine to gain a better understanding of the hydrology in the Winifrede coal seam and in the mine itself. Conditions in the mine were essentially dry and there was no active dewatering. There was no evidence of dripping water from the roof and there was no pooled water on the floor of the active mine area. The "walls" of the active mine area were slightly moist. All indications were that inflow to the mine is extremely slow.

Underground Mines–*Water Quality*–Water quality data from Rockspring's and Argus' active or closed underground mines associated with the Winifrede seam provide an indication of potential water quality in the same coal seam under the proposed lease tracts. The available data are presented in appendix G. In general, the water quality is good, with pH values above neutral and measurable concentrations of alkalinity.

A common issue related to water quality and coal mining is the formation of acid mine drainage (AMD). While Argus has received several notices of violation for AMD discharge at one of its surface mining facilities (Maggard 2007c), AMD has not been observed in existing underground operations extracting coal from the Coalburg/Winifrede seam. Previous evaluations by both Rockspring and Argus suggest that the acid generating potential from the Coalburg/Winifrede seam is limited (MM&A n.d., Attachment J-6, Table J-6.1; P&A 1999, Attachment I-9). In addition, the RFDS (appendix B) indicates that pyritic sulfur in Coalburg/Winifrede seam has an overall weighted average of 0.05 percent. Pyritic sulfur at this low level is generally not considered high enough to generate significant acidity (Price 1997).

Groundwater resource specialists performed an independent analysis of available data from the existing and reclaimed Rockspring or Argus mines associated with the Coalburg/Winifrede seam. These data included acid-base accounting (ABA) data for 29 samples from the immediate floor, roof, and coal associated with the Coalburg/Winifrede seam, ABA data for 20 samples from the Coalburg/Winifrede seam, and water quality data from existing or inactive mines associated with the Coalburg/Winifrede seam. The ABA data and analyses presented in appendix G indicate that the majority of the materials are classified as "uncertain" (EPA 1994, ADTI 2000). A classification of uncertain indicates that the materials should be examined further, not that acid generation is or is not expected to occur. Examination

of pyritic sulfur for available sample data indicates that pyritic sulfur values are generally low, below 0.3 percent which was identified by Price (1997) as a threshold value below which the amount of acidity generated is generally not a concern. Furthermore, up to half of the samples examined associated with the Coalburg/Winifrede seam have pyritic sulfur values less than 0.1 percent.

In absence of other testing data, water quality data from existing or inactive mines associated with the Coalburg/Winifrede seam were examined. Because these data represent actual field conditions, they provide a suitable method for further examination of the acid generating potential of the materials. Groundwater resource specialists examined groundwater data from Rockspring's Camp Creek Mine and data from Argus's No. 3, No. 6, and No. 8 mines, all associated with the Coalburg/Winifrede seam. In general, the groundwater has alkaline pH values (7 to 8) and contains alkalinity, in some cases significant alkalinity (up to 736 mg/L), as described in appendix G. Overall, as described in appendix G, the groundwater data do not indicate that AMD is an issue with the Coalburg/Winifrede seam.

Surface Mines–Surface mines exist in the vicinity of the proposed lease tracts. Surface mining activities must be performed in compliance with existing regulatory and permitting requirements. Potential impacts to groundwater resulting from surface mining activities such as pumping of groundwater to keep a mine dry include reduction in water quantity. That pumping can change the water balance in the aquifer. Other mining-related events that may occur, such as leakage of water from a slurry impoundment into an alluvial groundwater system, could impair water quality. No impacts to groundwater due to surface mining activities have been reported in the vicinity of the study area (Maggard 2007d, 2007e).

3.3.1c Groundwater Resources–Trends

On-going activities in the vicinity of the proposed lease tracts are expected to continue into the future. Any impacts to water quantity and quality due to those activities are expected to continue at approximately the current level. If these activities are expanded or new activities are initiated, negative impacts to water quantity and/or quality may increase.

3.3.2 Environmental Consequences

3.3.2a Scoping Issues

The issues raised during scoping for groundwater resources included concerns about:

- the impact on the quantity of water in wells in the vicinity of the proposed lease area,
- the adequacy of the coal barrier to prevent an increased flow of water between mine openings and downgradient waters (either surface waters or aquifers),
- the quality of potential seepage of groundwater to the surface, and
- the quality of groundwater in the vicinity of the proposed lease area resulting from the Proposed Action.

3.3.2b Significance Criteria

The criteria used to assess the significance of potential impacts to groundwater are dictated by the users of the resource, and cover the following two primary areas of concern:

Quantity

- ***For the two USACE wells or residential wells in the immediate vicinity of the proposed lease tracts***: a significant impact would be a sustained drop in the water level, induced by the proposed mining, that lowers the water level below the reach of the pump for an extended period of time.
- ***For the streams***: a significant impact would be a sustained drop in the volume of groundwater, caused by the proposed mining activities, that lowers the volume of groundwater contributing to base flow in a stream that crosses or adjoins the proposed lease tracts.
- ***For the lake***: a significant impact would be a mining-induced change in the seepage rate from the lake into the existing Coalburg/Winifrede seam outcrop that impacts the water balance of the lake in a significant manner.
- ***For riparian vegetation on the proposed lease tracts***: a significant impact would be a sustained drop in the phreatic zone, caused by proposed mining activities.

Quality

- ***For the USACE wells and residential wells in the immediate vicinity of the proposed lease tracts:*** a significant impact would be exceedances of applicable state drinking water quality criteria, which stem from the *Federal Safe Drinking Water Act.*
- ***For the receiving streams and the lake:*** a significant impact would be discharge of AMD into a stream or lake.

3.3.2c Impacts–Proposed Action (Preferred Alternative)

If the Proposed Action is selected and the coal mining RFDS is implemented, the existing underground mining operations in the Coalburg/Winifrede coal seam would be extended into the federal coal under the proposed lease tracts. The RFDS (appendix B) describes specific limits that would be applied to the lease:

- Approximately half of the federal coal would be left in place to form pillars supporting the roofs of the mines to prevent subsidence.
- No mining would occur within 100 vertical feet of the surface.
- No mining would occur within 150 horizontal feet of any point where the coal seam outcrops at the surface.
- No mining would occur within a minimum of 200 horizontal feet of the high water line of the lake shore. While this width may be expanded during the mine planning and permitting process, the 200-ft barrier is based on the 1977 USBM Information Circular 8741on mining near surface and underground bodies of water (Babcock and Hooker 1977).
- No mining would occur under the lake.

- Minimal mining is planned under perennial streams; where mining would occur, best management practices would be implemented and federal and state regulations and guidance would be followed to protect the stream.

In addition, if the Proposed Action is selected, the successful bidder(s) would be required to obtain appropriate federal and state permits and approvals. Throughout the mine planning and permitting processes, the successful bidder(s) would analyze geotechnical and hydrologic conditions and design the mine(s) to minimize development of any undesirable conditions.

3.3.2c1 Water Quantity–Changes in Water Level

Wells–Subsidence or fracturing can change the flow of water within and through rock layers. If the proposed mining were to cause subsidence or fracturing, the flow of groundwater under and near the proposed lease tracts could change. Subsidence or fracturing also could create or enhance a connection between the alluvial and/or stress-relief zone aquifers and the proposed mine voids. This connection could lead to drainage of the aquifer and increased water flow into the mine. Subsidence or fracturing could create or enhance a connection between existing water wells and the proposed mine voids. The connection could affect the volume, or recharge rate of water in wells located on or in the vicinity of the proposed lease tracts. Subsidence or fracturing could create or enhance a connection between the lake and the proposed mine voids. This connection could affect the volume of water in the lake, and increase the flow of water into the mine.

If the Proposed Action is selected and the coal mining RFDS (appendix B) is implemented, proposed mining would be performed in accordance with state and federal laws and regulations, and with methods similar to those in use in the vicinity of the proposed lease tracts. The analysis provided above in section 3.1.2 (Geology and Mineral Resources*)* indicates that the proposed room-and-pillar mining with approximately 50 percent extraction would greatly reduce the risk of subsidence. No significant subsidence is expected. This conclusion suggests that the proposed mining would cause minimal additional fracturing of the overburden. As a result, no significant impact to existing water wells in the vicinity of the proposed lease tracts is expected.

Furthermore, as described in the subsection 3.3.1 (Affected Environment) above, available information indicates that the current mining activities have not caused significant impacts to residential wells in the vicinity of existing underground operations.

With regard to potential groundwater resource users, the overburden and the Coalburg/Winifrede seam are geologic units with low-permeability. As described above (Affected Environment), the published values of hydraulic conductivity for this coal seam are low, and inflow rates to existing mine openings are low. The specialists observed dry conditions at the mining face during a visit to the existing Rockspring Ben Haley Branch Mine in October 2006. Given this range of values for hydraulic conductivity, the Coalburg/Winifrede seam would not provide sufficient yield for a production well such as a residential well, unless one were to be completed in the abandoned mine openings and was pumped intermittently, which is unlikely given the ownership variables.

Consequently, the proposed mining is not expected to significantly impact horizontal or vertical hydraulic conductivity, and is not expected to significantly impact users or potential users of groundwater resources.

Receiving Streams and the Lake–Under the RFDS, the proposed protective coal barrier around the lake would be 200 feet wide, in compliance with the 1977 USBM Information Circular 8741on mining near surface and underground bodies of water (Babcock and Hooker 1977). The rate of water discharge across this proposed 200-ft wide barrier of coal is expected to be low due to the relatively low hydraulic conductivity of the coal unit (appendix F). Because the coal barrier carries more of the lithostatic load after 50 percent of the coal is removed, the coal barrier may decrease in permeability due to removal of coal within the mined area (Thompson 2007). The rate of flow across the coal barrier also may be limited by the following factors:

- the rate of seepage into the mine is low due to the low vertical hydraulic conductivity of the overburden units above the coal seam (table 3.3-2)
- the dip of the coal is relatively shallow, thus limiting the amount of hydrostatic head that can build up behind the coal barrier

The rate of water seepage across the coal barrier is also dependent on how much water is pooled behind the barrier.

Due to the undulating geometry of the coal in this mining district, the coal does not uniformly dip in one direction, but rather dips locally in many directions. Based on the geometry of the Coalburg/Winifrede coal seam provided by Argus, the high point of the proposed mine south of the lake would be at an elevation of 880 feet in proposed Argus tract B. From this high point, the coal dips down to the west, north and back to the east, outcropping along the lake shore and along various sections of the streams leading into the lake. The summer pool level of the lake is 662 feet.

Based on the inflow rates available from existing mines, groundwater inflow to the proposed mine openings would be limited. The rate of groundwater flow into the open mine would be controlled largely by the vertical hydraulic conductivity of the geologic units above and below the coal unit. As described in section 3.1 (Geology and Mineral Resources) above, the vertical hydraulic conductivities of the overburden units above the Coalburg/Winifrede seam are quite low. In addition, the empirical observations in the Camp Creek Mine (0.01 to 0.02 gpm/acre) emphasize the low inflow rates. The low inflow rates at the Camp Creek Mine indicate that the stress-relief fracture zone in that area is not deep enough to enhance vertical flow of water into the open workings in the Winifrede seam at that location. The stress-relief fracture zone is described in subsection 3.3.1.

Prediction of inflow to the mine openings can be calculated based on the properties of the coal, or alternatively by using empirical information provided from adjacent mining operations.
Calculations using:

- the higher inflow rate of 0.02 gpm/acre observed by Rockspring (*see* section 3.1–Geology and Mineral Resources),
- the proposed acreage of the lease tracts (13,089 acres),
- an extraction rate of 50 percent, and
- no water losses after the water enters the mine workings

show that the mine would fill with water over 50 years after mining was completed. This result is supported by statements made by both Rockspring and Argus suggesting that mine infilling rates are slow

(Saunders 2008, Maggard 2008). Consequently, the hydraulic gradient provided by gravity and the water build-up behind the barrier may not develop. If these conditions were to develop, they would develop over long periods of time.

Three main scenarios regarding the flow of water across the coal barrier can be assessed, as described in appendix F and outlined below:

- **Scenario 1: Mining down dip:** The coal would be dipping down where it is exposed on a hillside, sloping in the same general direction as the topography. Water stored within the mine voids would move down dip under the force of gravity and form a pool of water against the coal barrier. The coal remaining in-place in the barrier would be at least somewhat permeable, and water would flow through the coal barrier and seep to the surface at the coal outcrop face (appendix F, figure F-2).
- **Scenario 2: Mining up dip where the outcrop is below the level of the lake or streams:** Water could seep into the coal barrier and eventually into the mine voids. The driving head, in this case, would be determined by the level of the lake or stream above the bottom of the coal outcrop (appendix F, Figure F-5).
- **Scenario 3: Mining up dip where the outcrop is above the level of the lake or streams:** The coal would be dipping up where it is exposed on a hillside, sloping in the opposite direction as topography. The coal barrier left in place to protect the outcrop would tend to desaturate as water drained from the coal barrier into the mine void. Specialists researched this case and found no precedent to indicate impacts to soil or vegetation occur under this scenario (appendix F, figure F-6).

Assuming that water does build up in the mine and pools against the coal barrier as described in scenario 1 above, the flow of groundwater from the mine, across the barrier, to the outcrop face can be estimated using Darcy's Law of flow through porous media. Those calculations are presented in appendix F. The calculations indicate a seepage rate of groundwater to the outcrop above the shoreline of the lake ranging from less than 0.01 to 4.5 gpm per 100 horizontal feet of outcrop. It is important to note that most of this seepage would seep down along the outcrop face and some would evaporate, while the remainder would seep into the soil at the base of the outcrop. Of the 18 miles of outcrop upstream of the lake, 24 percent occurs within 20 feet of the stream bed. Less than 4 percent of the 14 miles of outcrop along the lakeshore are within 20 feet of the summer average lakeshore elevation of 662 feet. The estimated seepage rates are sufficiently low to expect that outcrop seepage would not mix directly with stream or lake water. Consequently, the amount of seepage water that is expected to mix directly with surface water is limited. The majority of outcrop seepage would infiltrate into the soils at the base of the outcrop.

According to data available from the National Resources Conservation Service (NRCS), the mapped units of soils located between the Coalburg/Winifrede seam outcrop and the edge of the lake are comprised of coarse-grained sandy loam to loamy sand soils with moderately high to high drainage classifications. In addition, the soils contain a significant component of coarse material (i.e., gravel, cobbles and channery). The capacity of the most limiting layer to transmit water for the mapped units ranges from "moderately low to moderately high" (0.06 to 0.57 in/hr) to "moderately high to high" (typically defined as 0.2 to 1.98 in/hr, but for one map unit the rate is estimated to be 0.57 to 5.95 in/hr). These soils are vegetated and

stable. Due to the higher k_{sat}, coarse textured soils will drain more quickly, and are less likely to develop saturated conditions. Seepage is not expected to contribute to instability of slopes between the outcrop and the lake.

In some areas along the face of the outcrop, discharge could concentrate in one location as a result of preferential flow from a localized fracture. This concentrated surface expression of groundwater could be referred to as a spring. If a spring were to form, and if flow were sufficient, the water may reach a stream or lake. However, based on water quality data for the existing Camp Creek Mine and other analyses presented in appendix G, the quality of this discharging water would be expected to be good.

Under scenario 2 above, if lake water were to enter the mine voids along the north shore of East Lynn Lake, the water could seep through the coal barrier and enter the mine where the coal outcrops below the average summer lake level of 662 feet. The maximum predicted outcrop seepage rate from the coal is 0.42 gpm per 100 horizontal feet of outcrop (appendix F). The length of coal for which this is the case totals about 1,110 feet, or 0.21 miles. From this high point along the north shore of the lake, the coal dips down to the north and east. Based on this information, the total flow into the proposed mine facilities on the north side of the lake would be approximately 4.7 gpm. This flow of water represents a trivial amount of water relative to the other daily flows going into and out of the lake and would be a small loss to the lake (appendix F).

Under scenario 3 above, water from the protective barrier left in-place at the outcrop would move away from the ground surface and toward the void, eventually seeping out of the barrier and into the void. This water would move under the force of gravity to lower elevations in the mine void, where it would be managed during operations, or where it would collect behind a protective barrier following closure. This seepage is expected to be minor and not to have any significant effect.

3.3.2c2 Water Quality–Changes in Water Quality

***Drinking Water*–**Very few residential water wells are located on or in the immediate vicinity of the proposed lease tracts. The wells owned and operated by the USACE are at low risk of impact because these wells are likely drawing water from the stress-relief fracture zone, and would be protected by the proposed protective barriers, including the 200-ft lake barrier, the 150-ft outcrop barrier, and areas of no mining where overburden thickness is 100 feet or less. No significant subsidence is predicted under the proposed 50 percent extraction, room-and-pillar mining plan. Therefore, significant impacts to the shallow water-bearing zones are not expected. Localized fracturing likely may allow enhanced filling of water into the mine at unforeseen locations as a result of heterogeneities. However, the inflows would be limited to the discrete volumes of water trapped in those fractures as storage. Only in cases where those fractures connect with larger, expansive fracture systems would the shallow groundwater be impacted. In general, those types of expansive fracture systems have not been identified in this environment over the course of underground coal mining in the study area.

Specialists were provided data from one well that penetrates the Coalburg/Winifrede coal seam. The well (White, with identification number RS-23D) reportedly penetrates a pillar in a mined-out portion of Rockspring's operation adjacent to Laurel Creek (Barton 2007d). The well easily produces 20 gpm, and the water quality from lab testing is good. It is not known how much of the water is derived from the mined-out coal seam versus other layers.

Acid Mine Drainage–Groundwater seepage from coal mines may be a concern because AMD can occur, depending on the rock type, mineralogy, and conditions in the mine. As water inundates the mine it will come in contact with the floor of the mine and coal pillars within the mine. As water moves through the mine, minerals from the coal and other rock can dissolve into the water and impact the water quality.

As described above in section 3.3.1 previous evaluations by both Rockspring and Argus suggest that the acid generating potential from the Coalburg/Winifrede seam is limited and has less potential to generate acid than the No. 5 Block seam located higher up in the geologic section (Attachment J-6, Table J-6.1 inMM&A n.d.; P&A 1999, Attachment I-9).

Groundwater resource specialists performed an independent analysis of available data from the existing and reclaimed Rockspring or Argus mines associated with the Coalburg/Winifrede seam for this FLUA/FEIS. These data included ABA data for 29 samples from the immediate floor, roof, and coal associated with the Coalburg/Winifrede seam, ABA data for 20 samples from the Coalburg/Winifrede seam, as well as water quality data from existing or inactive mines associated with the Coalburg/Winifrede seam. The ABA data and analyses presented in appendix G indicate that the majority of the materials are classified as "uncertain" (EPA 1994, ADTI 2000). A classification of uncertain indicates that the materials should be examined further, not that acid generation is or is not expected to occur. Examination of pyritic sulfur for available sample data indicates that pyritic sulfur values are generally low, below 0.3 percent which was identified by Price (1997) as a threshold value below which the amount of acidity generated is generally not a concern. Furthermore, up to half of the samples examined associated with the Coalburg/Winifrede seam have pyritic sulfur values less than 0.1 percent. During mine planning and permitting, additional testing would be performed as necessary.

In absence of other testing data, water quality data from existing or inactive mines associated with the Coalburg/Winifrede seam were examined. Because these data represent actual field conditions, they provide a suitable method for further examination of the acid generating potential of the materials. Groundwater resource specialists examined groundwater data from Rockspring's Camp Creek Mine and data from Argus's No. 3, No. 6, and No. 8 mines, all associated with the Coalburg/Winifrede seam. In general, the groundwater has alkaline pH values (7 to 8) and contains alkalinity, in some cases significant alkalinity (up to 736 mg/L), as described in appendix G. Overall, as described in appendix G, the groundwater data do not indicate that AMD is an issue with the Coalburg/Winifrede seam. Based on this information, groundwater specialists expect that the water inundating the Coalburg/Winifrede seam in the proposed mines would tend to remain neutral.

3.3.2c3 Impacts–Proposed Action–Summary

No significant impacts to groundwater resources, either in water quantity or water quality, or to groundwater resource users are expected under the Proposed Action.

On-going activities on the surface of the proposed lease tracts, including oil and gas development, would continue under the Proposed Action and RFDS. These impacts are assessed in the chapter 4 (Cumulative Effects).

3.3.2d Impacts–No Action Alternative

Under the No Action Alternative, the federal coal would not be mined. No impacts to groundwater resources would be expected.

On-going activities on the surface of the proposed lease tracts, including oil and gas development, would continue under the No Action Alternative and NAS. These impacts are assessed in chapter 4 (Cumulative Effects).

3.3.2e Mitigation Measures

No significant impacts to groundwater resources are expected under the Proposed Action. Therefore, no mitigation measures are presented.

3.3.2f Residual Impacts

No significant impacts to groundwater resources are expected under the Proposed Action. Therefore, no residual impacts are expected.

3.3.2g Monitoring Recommendations

No significant impacts to groundwater resources are expected under the Proposed Action. Therefore, no monitoring recommendations are presented.

3.4 SOIL RESOURCES

The soil study area (figure 3.4-1) is all of the area within the outer boundary of the proposed lease tracts, and includes the stream corridors in between each of the lease tracts. Using this uninterrupted boundary allows the analysis to address riparian soils that would have been omitted had only land within the proposed lease tracts been described.

3.4.1 Affected Environment

Dekalb-Latham-Gilpin association soils are found on the proposed lease tracts. These soils are moderately deep, moderately- to well-drained, strongly sloping to steep. Fifteen mapped soil units containing eleven distinct soil series are present in the soil study area (table 3.4-1). Figure 3.4-2 presents the soil units as described by the Natural Resource Conservation Service (NRCS) in the *Soil Survey of Wayne County* (NRCS 2001). The majority of the soils are in one of three soil map units, described below:

- **Dekalb-Gilpin complex**, 35 to 65 percent slopes, very stony
- **Dekalb-Latham complex**, 25 to 35 percent slopes, and
- **Latham-Gilpin complex**, 8 to 15 percent slopes.

3.4.1a Dekalb Series

The Dekalb series consists of moderately deep, well-drained soils formed in acidic material weathered from sandstone on side slopes ranging from 25 to 65 percent. The soil texture is channery (thin, flat rock fragments) sandy loam to bedrock at a depth of 33 inches. Rock fragments range from 10 to 60 percent by volume. These soils are rated very poor for grain production, poor to fair for pasture, and fair for hardwood tree production. Limitations are due to erosion potential and excessive coarse fragments (NRCS 2001).

3.4.1b Gilpin Series

The Gilpin series consists of moderately deep, well-drained soils formed in acidic material weathered from interbedded shale, siltstone sandstone on ridges, benches, and side slopes ranging from 8 to 65 percent. The surface texture is silty loam to 6 inches and channery silty clay loam to weathered bedrock at 22 inches. Rock fragments range from 5 to 40 percent by volume. These soils are very poor for grain production, poor to fair for pasture, and fair for hardwood tree production. Limitations are due to erosion potential and excessive coarse fragments (NRCS 2001).

3.4.1c Latham Series

The Latham series consists of moderately deep, moderately well-drained soils formed in acidic material weathered from interbedded shale and siltstone on ridges, benches, and some side slopes ranging from 8 to 35 percent. The surface texture is silt loam to 4 inches and channery silt loam grading to channery silty clay, to weathered bedrock at 34 inches. Rock fragments range from 0 to 15 percent by volume in the A horizon and 0 to 30 percent in the B and C horizons. These soils are rated poor for grain production, fair for pasture, and good for hardwood tree production. Limitations are due to erosion potential (NRCS 2001).

3.4.1d Minor Series

Seven other minor soil series make up the remaining soils, including Pineville, Buchanan, Dormant, Grigsby, Udorthents, Beech, Lobdell and Guyandotte series. The minor soils are generally formed in colluvium (gravity deposited) on lower side slopes and foot slopes or alluvium (water deposited) on floodplains. They are moderately deep to deep and well-drained to moderately well-drained. The colluvial soil textures are channery to extremely channery loams and are strongly to extremely acidic. The alluvial soil textures are loam to sandy loam and are neutral to moderately acidic. Colluvial soils are rated very poor to fair for grain, fair to good for pasture and good for hardwood forest. Limitations are due to stoniness or erosion potential in the colluvial soils and wetness in the alluvial soils (NRCS 2001).

Indicators and trends regarding soils are based on the NRCS data. In general, the soils are rated as poor or fair for grain production, fair to good for pasture, and good for hardwood tree production. Limitations are generally due to steep slopes and excessive stones. No information is available to determine current trends.

Throughout the study area, soils can become exposed through natural processes when soils slump or trees fall. Rain falling on exposed soils can cause erosion and form ruts or “rills.” Since establishment of the

USACE East Lynn Lake Project, historical activities that occurred off of paved roads, such as recreational activities including biking and ORV use, mineral exploration activities, and oil and natural gas exploration and development activities, may have compacted soil and formed ruts or other features that are likely to erode. These features may continue to affect soil conditions by causing erosion. Current activities which may affect soil conditions include recreational activities such as hiking and ORV use, and oil and natural gas development. Development activities include construction, maintenance, and repair of oil and natural gas wells and associated collection pipelines and access roads. Recreational activities, especially ORV activities, have the potential to reduce soil productivity by causing soil compaction and erosion. A photograph of an area on the USACE East Lynn Lake Project impacted by ORV use is included in appendix C (photograph C-5).

Oil and gas extraction activities can reduce productivity by removing topsoil for access roads and drill pads or soil contamination from improper discharge of drilling fluids. These potential impacts would be offset somewhat as existing forest stands continue to mature and provide greater vegetation cover, which would reduce erosion losses. Because no timber harvest has occurred on the proposed lease tracts in decades, the stands that were described as noncommercial due to past timber harvest and clearing for pasture in the *Final Environmental Impact Statement East Lynn Lake, Twelvepole Creek, West Virginia* (USACE 1974b) will have progressed toward mature forest with greater vegetation cover. Vegetation resources are further described in section 3.5.

3.4.1e Applicable Laws and Regulations

- *Forest Cover Act* of 1960 (66 USC 580m-580n)
- *Endangered Species Act of 1973* (16 USC1531 et seq.), as amended
- Endangered and Threatened Wildlife and Plants (50 CFR 17)
- Designated Critical Habitat (50 CFR 226)
- Interagency Coordination–*Endangered Species Act of 1973*, as amended (50 CFR Part 402)
- Listing Endangered and Threatened Species and Designating Critical Habitat (50 CFR 424)
- Application Procedure (50 CFR 451)
- *Clean Water Act* Section 404
- Permits for Dredged or Fill Material into Waters of the U.S. (33 CFR 323)

3.4.2 Environmental Consequences

If the Proposed Action is selected and the RFDS (appendix B) is implemented, a maximum of 20 acres of surface disturbance may occur as a result of limited subsidence, surface activities such as exploration drilling or emergency rescue activities. Soil resources may be impacted during any of these activities.

If the RFDS is implemented, coal refuse material (usually composed of rock fragments derived from interseam shale or siltstone partings and waste rock materials from above or below the seam) would be excavated from underground mining areas and transported to existing, permitted coal refuse storage piles located on private land. Upon completion of mining activities, these coal refuse storage piles would be

regraded and revegetated in accordance with state and federal reclamation and closure permitting requirements.

3.4.2a Scoping Issues

No comments received during scoping identified soil resources as an issue of concern. However, some of the scoping comments identified indirect impacts to other resources that would occur at the same time as, or as a result of, impacts to soils. For example, concerns about impacts to vegetation resources were expressed. These impacts to vegetation might occur if changes in surface soil moisture occurred. Additionally, some of the comments identified water quality as an issue of concern. Impacts to water quality might occur as a result of surface disturbance that would in turn increase soil erosion, leading to increased dissolved and suspended solids in the area's waters.

3.4.2b Significance Criteria

The general management objective of the WVDNR *Operational Management Plan* (Dotson 1992) is to enhance the wildlife and forest resources, maximizing wildlife-related opportunities while protecting the land, forest, and water from damage or degradation. To support this general management objective, impacts to soil resources would be considered significant if:

- there is a loss of soil productivity on the proposed lease tracts due to clearing, or compaction sufficient to impact wildlife or forest resources, or
- conversion of soil to road is great enough to result in a measurable reduction in adequate habitat, or
- there is a measurable change in wildlife population abundance due to soil impacts.

3.4.2c Impacts–Proposed Action (Preferred Alternative)

If the Proposed Action is selected and the RFDS is implemented, underground mining would be performed. The successful bidder(s) would be required to prepare subsidence control plan(s) in compliance with relevant state and federal regulations. During a period of approximately 10 to 15 years, a maximum of 20 acres of surface disturbance is expected over the roughly 13,000 acres of the proposed lease tracts (approximately 0.15 percent of the total surface area). Surface disturbance may occur in small patches as a result of localized subsidence, or as a result of construction of exploration drill holes, ventilation shafts, or rescue shafts. Little to no subsidence is predicted (*see* section 3.1– Geology and Mineral resources) and no large, continuous areas of soil would be cleared. On-going activities on the surface of the proposed lease tracts, including ORV use and oil and gas development, would continue under the Proposed Action and RFDS.

Minimal to no change in the hydrologic regime is expected (*see* sections 3.2 and 3.3, Surface Water Resources and Groundwater Resources). With minimal to no change to the current surface water flow patterns, no change in current erosion patterns is expected. Direct impacts to soil resources resulting from the Proposed Action would be limited, and no significant impacts are expected.

3.4.2d Impacts–No Action Alternative

If the No Action Alternative is selected and the NAS is implemented, no mining would occur under the proposed lease tracts. On-going activities under the current management system would continue. Oil and gas development, legal and illegal ORV use, and hiking would continue on the surface of the proposed lease tracts.

Under the No Action Alternative, the current trend of impacts to soil resources, such as compaction and topsoil removal for roads and drill pads, would continue. No significant impacts are expected as a result of the No Action Alternative.

3.4.2e Mitigation Measures

No significant impacts to soil resources from the Proposed Action or No Action Alternative are predicted. Therefore, no mitigation measures would be necessary.

3.4.2f Residual Impacts

Because no significant impacts to the soil resources are predicted, no residual impacts are expected.

3.4.2g Monitoring Recommendations

Because no significant impacts to the soil resources are predicted, no monitoring is recommended.

3.5 VEGETATION RESOURCES

The term vegetation refers to trees, shrubs, herbaceous plants, and vines. The type of vegetation that grows in a given location is determined by numerous factors:

- the parent rock material
- the soil
- the slope of the land
- the aspect of the slope
- the amount of available moisture
- the amount of sunlight

Groups of plants and animals that are common in a given area are sometimes referred to as ecological communities or assemblages. Groups of assemblages sometimes are referred to as land cover types.

In 1972, the USACE conducted a timber inventory survey of the East Lynn Lake Project area. Results of this survey are summarized in Appendix B to the *Master Plan, Forest Management Plan* (USACE 1974c) and incorporated as Exhibit XVI in the *East Lynn Lake FEIS* (USACE 1974b). In 1984, the timber surveys were updated by the WVDNR for its 1985 *East Lynn Lake Wildlife Management Area Forest Management Plan*. In 1992, Dotson revised the *East Lynn Lake Wildlife Management Area Forest Management Plan*, referred to as the WVDNR *Forest Management Plan*. The WMA is shown on figure 1.1-4.

More recently, the *West Virginia-GAP Analysis Program* (GAP) (Strager 2000, Strager and Yuill 2002) used a different, but similar, classification system to map land within the state into one of 26 land cover types (Strager 2000, Strager and Yuill 2002). Both systems classified the land based on the dominant vegetation type. The GAP system further divides forested types based on position in the landscape. (figures 3.5-1 and 3.5-2)

3.5.1 Affected Environment

The vegetation study area (figure 3.4-1) is all of the area within the outer boundary of the proposed lease tracts, and includes the stream corridors in between each of the lease tracts. Using this uninterrupted boundary allows the analysis to address riparian vegetation that would have been omitted had only land within the proposed lease tracts been described. Photographs showing representative vegetation present on the USACE East Lynn Lake Project are shown in appendix C (photographs C-1, C-2, C-4, C-6, and C-10).

3.5.1a Terrestrial (Upland) Vegetation Communities

The GAP is a collaborative effort between federal and state agencies, non-profits and wildlife consortiums, to identify those species and wildlife communities not adequately represented, or "gaps," in conservation lands and efforts. According to the *West Virginia GAP* (Strager 2000), West Virginia's landscape is dominated by forested land cover types that occupy more than three-quarters of the state. The majority of the state is diverse, mixed moderately-moist (mesophytic) hardwood forest. Oak dominant forests cover about 20 percent of the state, while northern forest types–mountain hardwoods and conifers–cover almost 11 percent of West Virginia, mainly lands at higher elevations. About 3.6 percent of the state's land falls into developed cover classes, and just under 16 percent of the state falls into the agricultural land use class. Agricultural lands are most often pasture or old fields rather than row crops. Table 3.5-1 presents a summary of the cover types developed by the *West Virginia GAPAnalysis Program* (Strager 2000).

Ecological communities and land uses in West Virginia are highly influenced by the Allegheny Mountains. The proposed lease tracts are situated in the lower elevation Allegheny Plateau region. The region is classified in Bailey (2005) as Eastern Broadleaf Oceanic Province. A variety of vegetation communities are found, including cove hardwoods in moist hollows and glades, mixed mesophytic forests, floodplain forests, and oak-pine forests (Strausbaugh and Core 1970). Due to West Virginia's southern mid-Atlantic location and wide range in elevation, the state has a large number of plants and animal species that are considered to be near the northern or southern limit of their range.

During the 1972 USACE timber survey (USACE 1974c), staff performed a field reconnaissance of forested areas at the USACE East Lynn Lake Project. Plots were randomly located throughout the forested area and observations were made to determine species composition and other aspects of the main stand. Three type-groups were designated in accordance with the species composition of the main stand:

- Oak-hickory-white oak group
- Oak-hickory-red oak group
- Mesic hardwood group

The **oak-hickory-white oak group** consists of stands in which species of oaks and hickories predominate, and in which oaks of the white oak group are most prevalent. The **oak-hickory-red oak** group consists of stands in which species of oaks and hickories predominate, and in which oaks of the red oak group are most prevalent. Both oak-hickory type-groups are usually found on ridge tops or on south facing slopes. The **mesic hardwoods** consist of stands in which mixed mesophytic hardwood species predominate. This type-group is usually found in coves or on north facing slopes (USACE 1974c). The vegetation communities are dominated by hardwood forest, approximately evenly distributed between oak-hickory forest and mixed mesophytic forest (Dotson 1992).

Text in USACE Appendix B to the Master Plan (USACE 1974c) cited many associated species in both of the designated oak-hickory type-groups and in the mesic type-group. In addition to white oak (*Quercus alba*) and red oak (*Q. rubra*), post oak (*Q. stellata*), scarlet oak (*Q. coccinea*), black oak (*Q. velutina*), and chestnut oak (*Q. prinus*) are common to oak-hickory sites. Sprouts of blight-killed chestnut (*Castanea dentata*) are seen occasionally, but there is no evidence that this species will recover. Pitch pine (*Pinus rigida*), table mountain pine (*P. pungens*), and Virginia pine (*P. virginiana*) are found on south slopes and in old fields, where they may represent subclimax communities. Other species common to oak-hickory sites are:

- black gum (*Nyssa sylvatica*)
- black locust (*Robinia pseudoacacia*)
- sassafras (*Sassafras albidum*), and
- dogwood (*Cornus florida*).

The shrub layer is sparsely populated with such species as:

- mountain laurel (*Kalmia latifolia*)
- scrub oak (*Q. ilicifolia*)
- azaleas (*Rhododendron* spp.)
- green briar (*Smilax* spp.)
- wahoo (*Euonymus spp*.)
- redbud (*Cercis canadensis*), and
- blueberries (*Vaccinium spp*.).

Herbs common to these sites are:

- rattlesnake plantain (*Hieracium venosum*)
- tickseed (*Coreopsis major*)
- lousewort (*Pedicularis canadensis*)
- yellow foxglove (*Gerardia laerrigata*)
- pink lady's slipper (*Cypripedium acaule*), and
- alumroot (*Henchera americana*).

Tree species commonly associated with the mesic type-group are:

- beech (*Fagus grandifolia*)
- yellow-poplar (*Liriodendron tulipifera*)
- white basswood (*Tilia heterophyllla*)
- sugar maple (*Acer saccharum*)
- black maple (*Acer nigrum*)
- sweet buckeye (*Aesculus octandra*)
- red oak (*Q. rubra*),
- white oak (*Quercus alba*)
- eastern hemlock (*Tsuga canadensis*)
- black birch (*Betula lenta*)
- black walnut (*Juglans nigra*)
- red maple (*A. rubrum*)
- American elm (*Ulnus americana*)
- slippery elm (*U. rubra*)
- black locust (*Robinia pseudoacacia*),
- shagbark hickory (*Carya ovata*), and
- bitternut hickory (*C. cordiformis*).

Subcanopy species include:

- sourwood (*Oxydendrum arboreum*)
- blue beech (*Carpinus caroliniana*)
- redbud (*Cercis canadensis*)
- striped maple (*A. pensylvanicum*)
- dogwood (*Cornus florida*)
- Frasers' magnolia (*Magnolia fraseri*)
- umbrella magnolia (*M. tripetala*)
- serviceberry (*Amelanchier arborea*)
- hop-horn beam (*Ostrya caroliniana*), and
- holly (*Ilex opaca*).

The shrub layer usually consists of:

- pawpaw (*Asimina triloba*)
- hydrangea (*Hydrangea arborescens*)
- alternate leaf dogwood (*C. alternifolia*)

- spicebush (*Lindera benzoan*)
- witch hazel (*Hamamelis virginiana*)
- Hercules club (*Aralia spinosa*)
- black haw (*Viburnum prunifolium*)
- gooseberry (*Ribes spp*.)
- black elderberry (*Sambucus canadensis*)
- buffalo nut (*Pyrularia. pubera*)
- wahoo (*E. americanus, E. atropurpereus*), and
- maple leaf viburnum (*V. acerifolium*).

Woody vines (*lianas*) include Virginia creeper (*Parthenocissus quinquefolia*), wild grape (*Vitis spp*.), bittersweet (*Celastrus scandens*), and greenbriar (*Smilax spp*).

The herbaceous layer of mesic sites includes:

- jack-in-the-pulpit (*Arisaema triphyllum*)
- yellow fawn lily (*Erythronium americanum*)
- white fawn lily (*E. albidum*)
- large-flowered bellwort (*Uvularia grandiflora*)
- white wood lily (*Clintonia umbellulata*)
- plumelily (*Smilicina racemosa*)
- Indian cucumber-root (*Medeola virginiana*)
- Solomon's seal (*Polygonatum biflorum*)
- wake robin (*Trillium erectum*)
- large-flowered trillium (*T. grandiflorum*)
- wild ginger (*Asarum canadense*)
- goldenseal (*Hydrastis canadensis*)
- dwarf larkspur (*Delphinium tricorne*)
- rue anemone (*Anemonella thalictroides*)
- hepatica (*Hepatica Americana, H. acutiloba*)
- blue cohosh (*Caulophyllum thalictroides*)
- twin leaf (*Jeffersonia diphylla*)
- mayapple (*Podophylum peltatum*)
- bloodroot (*Sanguinaria canadensis*)
- pale corydalis (*Corydalis flavula*)
- Dutchman's breeches (*Dicentra cucullaria*)

- squirrel corn (*D. canadensis*)
- toothwort (*Dentaria laciniata*)
- stonecrop (*Sedum terratum*)
- bishop's cap (*Mitella diphylla*)
- foam-flower (*Tiarella cordifolia*)
- downy yellow violet (*Viola pubescens*)
- smooth yellow violet (*V. pensylvanica*)
- green violet (*Hybanthus concolor*)
- blue phlox (*Phlox divaricata*)
- sweet cicely (*Osmorhiza claytoni, O. longistylis*)
- bluebells (*Mertensia virginica*), and
- blue-eyed Mary (*Collinsia. verna*).

Common ferns are:

- Christmas fern (Polystichum acrostichoides)
- maidenhair fern (Adiantum pedatun)
- fragile fern (Cystopteris fragilis)
- marginal shield fern (Dryopteris marginalis), and
- lady fern (Athurium asplenioides).

The West Virginia GAP (Strager 2000, Strager and Yuill 2002) information indicates that eight land cover types are present within the vegetation study area boundary (table 3.5-2 and figure 3.5-1). The GAP classified approximately 72 percent of the area as mixed mesophytic hardwood (generally corresponding to the mesic hardwood group from USACE 1974c), 14 percent as oak dominated forest (generally corresponding to the oak dominated groups from USACE 1974c), 8 percent as surface water, 4 percent as hardwood/conifer forest, 1.6 percent as pasture/grassland, with cove hardwood forest, mountain hardwood forest, urban and barren land making up less than 1 percent each. Mixed mesophytic and oak-dominated forests are the most common cover types in West Virginia, encompassing 38 and 20 percent, respectively, of land cover type in the state (Strager 2000).

About 6,000 acres of the approximately 22,000 acres of forest were classified as non-commercial (Dotson 1992). The condition and composition of the forest stands reflected past land uses, including logging and clearing for pasture. Most of the area used for pasture has been abandoned and now supports second growth forest of varying age classes. The forest in the vicinity of the proposed lease tracts is somewhat fragmented. Several dirt and paved roads and utility rights-of-way cross the proposed lease tracts.

Invasive and exotic plant species are found in the vicinity of the proposed lease tracts. While no kudzu has been observed on the USACE East Lynn Lake Project, the plant has been observed within nearby railroad ROWs. Autumn olive is common. Historically, crown vetch was planted as a bank cover and later found to be ineffective, and though resource managers eradicated the plant, individuals still survive.

Tree-of-heaven is an occasional species, found on poor soils, around old home sites, along roadways and railroad ROWs. Purple loosestrife grows along roadside ditches. No mile-a-minute has been observed.

Many potential indicators could be used to assess the condition of the vegetation communities in the vegetation study area. Possible indicators include timber volume, timber productivity, basal area, species richness, and species diversity. The most appropriate indicator depends on the management goal for the land. For example, if timber harvest were the goal, the appropriate indicator would be productivity and/or timber volume. Species diversity, measured as total number of species or relative distribution of species, is another possible indicator. For wildlife management, which is a stated goal for the USACE East Lynn Lake Project, the appropriate indicator is demonstration that a range of stand conditions exist, from open grasslands to young-growth timber, to mid-successional to mature timber stands.

In its *East Lynn Lake Wildlife Management Area/Forest Management Plan (Forest Management Plan),* the WVDNR states that the desired future condition of the forest area will be (Dotson 1992):

> …a mosaic of tree stands and openings with a near optimum quantity and dispersion of the habitat elements that feature the wild turkey and along with associated wildlife species. Management emphasis will focus on manipulation of the naturally occurring tree species composition to optimize hard mast production, age class distribution and assure a continuous mast supply.

The following elements of diversity are contemplated in the *Forest Management Plan* (Dotson 1992):

- Permanent openings: 5 percent of the area
- Old growth stands: 5 percent of the area
- Conifer component: 5 to 25 percent of the area

Indicators and current conditions are based on the West Virginia GAP land use data, which indicate that about 1.0 percent of the area is in clearings and 3.8 percent is Hardwood/Conifer Forest (table 3.5-2). Although data used do not indicate what percentage of the forests are considered old growth, current conditions have not achieved the desired diversity for the other two categories as defined in the WVDNR *Forest Management Plan*. The GAP data indicate that the current conditions have not achieved the desired diversity. Within the watershed, historical and current surface activities including logging, surface mining, ORV use, residential home construction, and oil and gas well and access road construction may have impacted vegetation.

Within the USACE East Lynn Lake Project, historical activities that occurred off of paved roads, such as ORV use; oil and gas wells; pipelines; or access road construction, maintenance, or repair, and mineral exploration activities, may have caused direct impacts to vegetation resources, and indirect impacts such as soil erosion. A photograph of an area on the USACE East Lynn Lake Project impacted by ORV use is included in appendix C (photograph C-5). Historical surface disturbances that remain unremediated have the potential to impact vegetation indirectly through erosion and sedimentation of soils. These activities may directly impact vegetation by damaging or destroying existing vegetation.

Current activities on the USACE East Lynn Lake Project which may affect vegetation include recreational activities (hiking, biking and ORV use), and construction, maintenance, repair, and collection activities associated with oil and gas wells. These activities may impact vegetation directly by damaging

or destroying the vegetation. In addition, recreational activities have the potential to impact vegetation indirectly by compacting soils to the point where plants cannot grow. Oil and gas activities can impact vegetation indirectly by removing topsoil for access roads and drill pads and reducing productivity, or by contaminating soil through improper discharge of drilling fluids or produced water. These potential impacts would be offset somewhat as existing forest stands mature and provide greater vegetation cover, which would reduce erosion losses.

No timber harvest has occurred on the proposed lease tracts in decades, and the stands that were described as non-commercial due to past timber harvest and clearing for pasture (Dotson 1992) have progressed toward mature forest with greater vegetation cover. In the absence of other disturbance activities, this trend would be expected to increase the old growth component and reduce the permanent openings.

3.5.1b Wetland and Riparian Vegetation

Wetlands generally include swamps, marshes, bogs, and similar areas. Riparian areas are those areas surrounding streams, rivers, or lakes. Wetland and riparian areas can provide essential habitats for wildlife, provide flood protection through absorption of storm water, improve water quality by retention of sediments and/or pollutants, and add scenic diversity and esthetic value to the landscape. Federal and state legislation exist to preserve wetland values and functions.

According to the WVDNR *Forest Management Plan* (Dotson 1992), wetlands are limited and present as riparian zones at the edge of the lake and along streams. The WVDNR considers wetlands to be critical habitat that will be protected and, when feasible, enhanced (Dotson 1992).

The USFWS maintains national wetland inventory (NWI) maps. The NWI information (USFWS 2007b) indicates that seven wetlands are present within the USACE East Lynn Lake Project boundary, and one wetland totaling approximately 0.1 acre is located completely or partially within the proposed lease tract boundaries (table 3.5-3 and figure 3.5-2).

Table 3.5-3
NWI Mapped Wetlands within
the USACE East Lynn Lake Project
and the Proposed Lease Tracts

Wetland ID	Wetland Type	Area Within the USACE East Lynn Lake Project Boundary (acres)	Area Within Proposed Lease Tracts (acres)	Notes
1	Freshwater Emergent Wetland	0.40		
2	Freshwater Forested/Shrub Wetland	1.22		
3	Freshwater Forested/Shrub Wetland	0.42		
4	Freshwater Emergent Wetland	0.56		
5	Freshwater Forested/Shrub Wetland	0.18		
6	Freshwater Emergent Wetland	1.54		
7	Freshwater Forested/Shrub Wetland	0.10	0.10	Wetland completely within Argus proposed lease tract C

Note: Values are approximate
Source: USFWS 2007b

On the USACE East Lynn Lake Project, existing wetlands have been observed in a few locations along the edges of the lake at summer pool elevation, where streams flow into the lake. Some wetlands are also associated with seeps or springs. Observed wetlands are typically less than 0.5 acre in size (Smith 2007h and Smith 2007j). Minimal information on wetland and riparian areas on the proposed lease tracts is available.

The USGS maintains a national hydrography dataset (NHD) that contains information about surface water features such as lakes, ponds, streams, rivers, springs and wells (USGS 2007a). The NHD streams commonly have riparian habitat associated with them. The NHD data (2006) show eight streams occurring within the USACE East Lynn Lake Project (figure 3.5-2):

- Brush Creek
- Indianlick Branch
- Beechy Branch
- Bluelick Branch
- part of Kiah Creek

- part of Cove Creek
- part of East Fork Twelvepole Creek
- part of Twelvepole Creek

West Virginia GAP (Strager and others 2000, Strager 2000) riparian and wetland data for the vicinity of the lease tracts are summarized in table 3.5-4 and on figure 3.5-3 In addition, REIC (2000 through 2006) indicate that riparian systems occur within the USACE East Lynn Lake Project boundary and within the proposed lease tracts.

Table 3.5-4
West Virginia GAP Analysis Riparian Areas and Wetlands That Occur on the USACE East Lynn Lake Project and Proposed Lease Tracts

West Virginia GAP Attribute	Area within the USACE East Lynn Lake Project[2] (acres)	Area within the Proposed Lease Tracts[2] (acres)
Non-forested headwater stream riparian	37	8
Non-forested small stream riparian	40	4
Forested headwater stream riparian	648	219
Forested small stream riparian	531	135
Shrub wetlands	1	0
Open water wetlands	298	15
Lakes	1,459	28
TOTAL	**3,012**	**409**

[1] Source: Strager and others 2000; Strager 2000
[2] All acreages are estimated

Of the six riparian area and wetland cover types identified on the proposed lease tracts, the forested headwater stream riparian cover type has been mapped on the largest portion (approximately 200 acres) of the area. This forested headwater stream riparian cover type has been mapped on 610,073 acres in West Virginia, and makes up 32.5 percent of the 1,877,911 acres of riparian and wetland cover types mapped in the state (Strager and others 2002).

Fringe wetlands near the lake are affected by the elevation of the lake pool. The USACE manages the lake elevation throughout the year, maintaining a summer pool elevation and a winter pool elevation. During these seasons, the elevation is fairly consistent, and the associated wetlands and riparian areas are fairly stable.

Within the watershed, surface activities that may impact wetland and riparian areas include: logging, mining, residential home construction, ORV use (*see* photograph C-5 in appendix C), pad and mud pit

construction for exploratory drilling for coal or oil and natural gas, or for production drilling for oil and natural gas, pipeline and storage tank construction and maintenance, and access road construction. On the East Lynn Lake Project, ORV use outside of designated areas has the greatest impact to wetlands and riparian areas, damaging soils and vegetation, and stirring up sediments to create turbid water conditions and possibly release any chemicals that had been bound to the sediments. Four-wheeled ORVs create two track trails and contribute proportionally more to this disturbance than two-wheeled vehicles and single-track trails. Where vegetation is able to re-establish on disturbed surfaces, impacts have been minimized (Smith 2007j). However, if plant cover is unable to re-establish, such impacts contribute to soil erosion and may impact water quality in receiving waters.

Based on a review of the NWI wetland data (USFWS 2007b) and the West Virginia GAP data (Strager and others 2002, Strager 2000), the wetland and riparian areas in the vicinity of the proposed lease tracts have remained the same size, with possible minor fluctuations with the seasons, lake water levels, and weather patterns. Some disturbance of wetland and riparian areas has occurred as a result of vehicle and recreation use. Oil and gas development activities may impact wetland and riparian areas. If oil and gas companies comply with existing regulations, and implement appropriate avoidance, minimization and mitigation measures, impacts to wetland and riparian areas should be minimal. Given current management practices, no change in resource condition is expected.

3.5.1c Forestry and Woodland Products

The commercial forest resource, a subset of the forest vegetation, is summarized in this section. The forest vegetation is also described in section 3.5.1a (Vegetation). The timber resource was inventoried during development of both the USACE and WVDNR plans cited below. The timber was heavily harvested in the late 1800s and early 1900s for fuel, building material, and to clear the land for agricultural use. The forest has since regrown and has matured further since the inventories of the 1970s and 1980s.

As described above, the current forest type on the proposed lease tracts is evenly distributed between mixed oak-hickory and mixed mesophytic. The slopes present on the proposed lease tracts are steep, with conditions that are excellent for hardwood growth. Insect and disease infestation are not considered a problem. The gypsy moth has not arrived at the USACE East Lynn Lake Project; however the pine beetle and the ash borer beetle are present at the USACE East Lynn Lake Project (Smith 2007a). Dotson (1992) indicates that part of the forest contains timber with commercial value.

The most recent timber data for the USACE East Lynn Lake Project were gathered in 1972, and are presented in the *East Lynn Lake FEIS* (USACE 1974b). According to these data, both commercial timber and non-commercial timber are found within the USACE East Lynn Lake Project (or USACE 1974b, Dotson 1992). The USACE East Lynn Lake Project is divided into 13 commercial timber compartments (table 3.5-5 and figure 3.5-4). Compartments 1, 2, 3, 6, 7, 10 and 13 contain the most timber with commercial value (Dotson 1992).

Table 3.5-5 and figure 3.5-4 show the commercial timber land compartments and the non-commercial timber land found within the USACE East Lynn Lake Project, based on 1972 data (USACE 1974b, Dotson 1992), which is the most recent data available. The WVDNR *Forest Management Plan* (Dotson 1992) allows for timber sales, and the WVDNR has a license (DACW69-3-09-1016) to manage the forest

until October 31, 2033. If stands were to be cut commercially, all stands to be cut would be advertised for bid and the proceeds would return to the USACE East Lynn Lake Project for wildlife and forest management (Dotson 1992). However, no timber harvest has occurred because the State of West Virginia has not planned for or offered any harvest. While illegal taking of wood for firewood and décor has occurred (USACE 1974c), no legal timber harvest has taken place in decades (Smith 2007a). Because no timber harvest has occurred on the proposed lease tracts since the 1972 survey, the stands that were described as noncommercial due to past timber harvest and clearing for pasture in the *East Lynn Lake FEIS* (USACE 1974b) will have progressed toward mature forest with greater vegetation cover.

Table 3.5-5
Commercial Timber Compartment Boundaries within the USACE East Lynn Lake Project Boundary

Compart-ment ID	Compartment Name	Acreage within the Project Boundary	Name of Proposed Lease Tract within the Compartment	Acreage within the Proposed Lease Tract Areas
1	Kiah Creek	1234	Rockspring tract E, tract F; Argus tract C	1,068
2	Twelvepole Creek	2744	Argus tract A, tract B, tract C	2,388
3	Bluelick Branch	1606	Argus tract B	1,550
4	Porter Knob	1014	Argus tract B	134
5	Beechy Branch	1350	Argus tract B	1,304
6	Lower Rich Creek	2272	Argus tract B	554
7	Upper Rich Creek	2407	Argus tract B	913
8	Brush Creek	2656	None	0
9	Napier Ridge	1178	None	0
10	Bartram Branch	1384	Rockspring tract A	1,077
11	Lake Fork	1006	Rockspring tract C	740
12	Lick Creek	871	Rockspring tract B, tract C	668
13	Cove Creek	1853	Rockspring tract C, tract D, tract E	1,569

Source: Dotson 1992

Since the USACE East Lynn Lake Project dam was constructed and the lake permanently filled in March 1972 (USACE 1974c), the management of the forest and woodland products has stayed the same with no legal timber harvest occurring in decades (Smith 2007a). Illegal taking of wood will probably continue (Smith 2007g), and if demand is sufficient and funding is available to prepare and manage sales, some timber could be offered for sale in the future, primarily to achieve habitat management goals.

The predicted changes in the condition of resources given the current management situation are that timber harvests will occur in the future, and probably within the next 5 years (Smith 2007a). Revenues from any harvest will be available for local management activities and projects which could help improve conditions for wildlife and visitors.

3.5.1d Wildland Fire Ecology and Management

Vegetation resources such as the forests found in the vicinity of the proposed lease tracts are subject to fire. To assess the likelihood of fire in a given area, the Fire Regime Condition Class (FRCC) Interagency Working Group consisting of federal, private and public organizations created the fire regime classification system (FRCC 2005), summarized in table 3.5-6. The FRCC system classifies fire regime conditions of an area or landscape based on how much the present condition has been altered from the historical condition. The landscape features to be compared include vegetation, fuels, and disturbance regimes. By determining the acreage under each FRCC over time, biologists can quantify the ecological conditions (FRCC 2005).

Table 3.5-6
Definitions of Fire Regime Conditions

Class	Definition
1	Fire regimes that are within historic ranges; the risk of losing key ecosystem components from the occurrence of fire is low.
2	Fire regimes that have been moderately altered from their historic range by either increased or decreased fire frequency. The risk of losing key ecosystem components is at a moderate risk.
3	Fire regimes that have been substantially altered from their historic range. Vegetation attributes have been substantially altered. The risk of losing key ecosystem components is high.

Source: FRCC 2005

The USACE East Lynn Lake Project is located in a section of West Virginia noted for frequent forest fires. Indicators of historical ground fires include observation of charred stumps and logs throughout a given area (USACE 1974c). Research on oak forests in the eastern U. S. suggests that presence of abundant oak is often associated with recurring fires (Abrams 1992). As described above, the vegetation communities found on the USACE East Lynn Lake Project are dominated by hardwood forest, approximately evenly distributed between oak-hickory forest and mixed mesophytic forest (Dotson 1992).

Using the FRCC system described above, the forest at the USACE East Lynn Lake Project is most likely a Class 1 forest (Smith 2007b). If a fire were to start and get out of control in an area where a coal seam outcropped, the coal could ignite. The risk of a coal seam fire is greatest in an area where the seam has been exposed by excavation or by erosion. No coal seams within the proposed lease tracts are currently on fire. Ignition of one of these seams is unlikely.

Wildfires impact the health of the forest. The USACE *East Lynn Lake Project Forest Management Plan* (USACE 1974c) includes a plan of suppressing wildfires and prohibiting prescribed burns. Public education is also part of the plan. The Wildfire Suppression Safety Committee meets periodically to review and recommend safety standards, in accordance with the USACE *Operational Management Plan* (USACE 2006a). The USACE *Operational Management Plan* also states that constructing fire breaks is unnecessary because existing roads, trails, rights-of-way, and old roadbeds are generally sufficient for

firebreaks (USACE 2006a). In addition to the information contained in the USACE plans, the USACE East Lynn Lake Project Resource Manager receives fire surveillance and fire hazard rating information from the West Virginia Division of Forestry (WVDOF) (Dotson 1992).

Healthy trees are less likely to burn intensely, and an abundance of deadwood will burn quickly. The hotter the fire, the more difficult it is for a forest to recover. Trees within the USACE East Lynn Lake Project are healthy because insect and disease infestations are not a problem (Dotson 1992). The primary causes of fires are human-induced causes, such as arson and vehicular fires, with the major causes of wildfires in the area being debris burning or arson (USACE 2006a). No prescribed fires and no timber harvests, which are often followed by planned slash burning, have occurred on the USACE East Lynn Lake Project (Jay Davis 2007a). Based on trends between the years 1997 and 2006, the fire history for the USACE East Lynn Lake Project area includes an average of two fires per year with an average of 140 acres burned per year. The historical fire occurrence frequency for any given area is 30 years.

During the last five years, the intensity, frequency, and duration of wildfires in the vicinity of the proposed lease tracts has decreased. Two main factors contribute to this decrease: timeliness of rainfall and increased preparedness of the local volunteer fire departments. The local fire departments have received federal equipment through state programs, enabling them to work on federally managed properties. They also have received more training. As a result, these local fire departments have become more skilled at containing and extinguishing fires, and have become more involved with the USACE East Lynn Lake Project (Smith 2007 b, e). Before each fire season, all firefighting equipment, clothes, and materials is inventoried and checked to be sure they are on hand and ready in the event of a fire (USACE 2006a). In addition, the USACE verifies that access roads, particularly in areas of high fire history, receive proper maintenance.

The frequency and intensity of wildfires will probably stay similar to current conditions, except during periods of drought when wildfires may increase (Smith 2007a). Given current management practices, no changes in the resource condition are expected (Smith 2007a). If timber harvest occurs in the future, it may alter the fire conditions.

3.5.2 Environmental Consequences

3.5.2a Scoping Issues

3.5.2a1 Upland Vegetation Communities

Five of the scoping comments related to vegetation resources. In general, these comments related to potential subsidence and changes to hydrology. Two comments related to impacts to wetlands and terrestrial vegetation due to subsidence. One comment addressed potential changes to forest vegetation due to soil moisture changes. Two comments expressed concern that the integrity of intact blocks of forest cover found in the East Lynn Lake watershed need to be preserved.

3.5.2a2 Wetland and Riparian Communities

No scoping comments focused on wetland and riparian communities.

3.5.2a3 Forestry and Woodland Products and Wildland Fire Ecology and Management

The following scoping issues were identified related to forestry and woodland products and wildland fire ecology and management:

- Evaluate the potential for fires on the surface to spread to the coal seam and vice versa.
- Changes in forest type or growth due to changes in hydrology or soil moisture.
- Overall effects to the large, generally intact forest area in the region.

3.5.2b Significance Criteria

3.5.2b1 Upland, Wetland, and Riparian Vegetation Communities

Impacts to vegetation communities could result directly from surface clearing for exploration drill holes, ventilation shafts, or rescue shafts; loss of soil through erosion; or subsidence. Vegetation could be indirectly impacted due to changes in hydrology that would result in inadequate moisture to support the existing vegetation communities.

Due to the relationship between vegetation and other resources (such as, wildlife, fisheries, water quality, soils, recreation, land use and visual resources), the significance of change in vegetation would be a function of the relative effect on these other resources. Timber production is not extensive under the current WVDNR management plans and direction.

Significant vegetation impacts may occur if there is:

- **permanent loss of vegetation cover** that would cause a measurable change in wildlife population abundance, or
- **filling in of wetlands** that would require an individual 404 permit.

3.5.2b2 Forestry and Woodland Products and Wildland Fire Ecology and Management

The following significance criteria have been identified for timber and wildland fire ecology and management:

- loss of commercial timber over 5 percent or more of the proposed lease tracts
- loss of reasonable access to the commercial timber
- increase in average annual frequency of fires or acreage burned by 10 percent or more when compared to the past 10 years
- underground coal fire that cannot be extinguished

3.5.2c Impacts–Proposed Action (Preferred Alternative)

If the Proposed Action is selected and the RFDS is implemented, underground mining would be performed. The successful bidder(s) would be required to prepare subsidence control plan(s) in compliance with relevant state and federal regulations. During a period of approximately 10 to 15 years, a maximum of 20 acres of surface disturbance is expected over the roughly 13,000 acres of the proposed lease tracts (approximately 0.15 percent of the total surface area). Surface disturbance may occur in small

patches as a result of localized subsidence, or as a result of construction of exploration drill holes, ventilation shafts, or rescue shafts (also identified in the Cumulative Effects analysis, section 4.0 of this document). Little to no subsidence is predicted (*see* section 3.1– Geology and Mineral Resources), and no large, continuous areas of vegetation would be cleared.

3.5.2c1 Upland Vegetation Communities

If the Proposed Action is selected, the RFDS would be implemented and underground mining would be performed. Limited subsidence is expected (*see* section 3.1–Minerals subsection under Geology), and no large, continuous areas of forest would be cleared. However, during the proposed 15-year span of federal coal mining, a maximum 20 acres of surface disturbance could occur in small patches as a result of limited subsidence, or as a result of construction of exploration drill holes, ventilation shafts, or rescue shafts. If the Proposed Action is selected, the federal coal leases would be issued for competitive bid. The successful bidder(s) would be required to obtain a permit from OSM, which would include post-mining plans for reclamation, including revegetation.

Also, as described in the RFDS (appendix B), protective barriers would be maintained between the underground mining activity and surface water resources. Minimal to no change in hydrologic regime is expected (*see* sections 3.2 and 3.3–Water Resources).

In summary, a temporary loss of a maximum 20 acres of vegetation (approximately 0.15 percent of the proposed lease tracts) may occur under the Proposed Action. This impact, even if long-term, would be considered minimal.

On-going activities on the surface of the proposed lease tracts, including ORV use and oil and gas development, would continue under the Proposed Action and RFDS. These impacts are assessed in chapter 4 (Cumulative Effects).

3.5.2c2 Wetland and Riparian Vegetation

If the Proposed Action is selected and the RFDS is implemented, no large areas of forest would be cleared. However, a maximum of 20 acres of surface disturbance may occur on the proposed lease tracts.

If the Proposed Action is selected and the RFDS is implemented, the successful bidder(s) would be required to prepare subsidence control plan(s) in compliance with relevant state and federal regulations. Minimal to no subsidence is expected (*see* section 3.1–Minerals subsection under Geology). Protective barriers would be maintained between the mining activity and surface water resources (RFDS, appendix B). Minimal to no impact to the existing hydrologic regime is expected (sections 3.2 and 3.3, Water Resources). Therefore, impacts to ecological function and habitat are expected to be minimal. Consequently, implementation of the RFDS is not expected to cause direct impacts to the 0.1 acre of wetland or 366 acres of riparian area identified on the proposed lease tracts (tables 3.5-3 and 3.5-4 or figure 3.5-3), and any impacts that may occur are unlikely to lead to significant impacts to habitat. Furthermore, the 15 acres of open water wetlands identified by the GAP analysis (table 3.5-4 or figure 3.5-2) are associated with the lake shoreline, and no surface disturbance is planned for the lake shoreline. Therefore, no direct or indirect impacts to wetlands or riparian resources are expected if the Proposed Action is selected and the RFDS is implemented.

3.5.2c3 Forestry and Woodland Products

Impacts to forestry and woodland products as a result of the Proposed Action and associated RFDS are expected to be limited. The maximum expected surface disturbance of 20 acres over 10 years may remove 20 acres of commercial trees or other forest products (poles or saplings), or cause damage to a few trees, depending on the specific location of the disturbance. A major change in groundwater quantity or quality has the potential to affect forest vegetation in type or growth, but no change in groundwater or in vegetation is expected.

The forest vegetation in the area is dependent primarily on soil moisture and water in the unsaturated zone above the water table known as the vadose zone. Water in this zone comes from on-site precipitation and is not likely to be impacted by the proposed underground coal mining. The use of access roads for the proposed surface activities might conflict with forest management or harvest temporarily, but that impact would be limited to a few weeks. Increased human activity associated with proposed surface activities could also contribute to illegal harvest or theft. Based on the information summarized above, the expected potential impacts to this resource are not considered significant.

3.5.2c4 Wildland Fire Ecology and Management

Impacts to wildland fire ecology and management as a result of the Proposed Action and associated RFDS are expected to be limited. The proposed maximum surface disturbance of 20 acres over 10 years may provide improved access for fire suppression or even act as fuel breaks where trees and other ladder fuels are removed. The proposed activities described in the RFDS could result in accidental ignitions from construction or drilling; however, because permits associated with coal mining activities require the user to provide suppression resources on site, the potential occurrence of these incidents would be mitigated. In addition, preventive measures could be implemented, including avoiding accumulation of combustible materials on or near seam exposures, and preventing unmanaged exposures of the seam. Minimal subsidence is expected under the Proposed Action, so the risk of coal seam fires starting or spreading as a result of subsidence is low.

No prescribed fires or managed fire activity has occurred on the USACE East Lynn Lake Project, and none are expected based on the existing plans. As a result, these types of activities would not be impacted by the proposed activities in the RFDS in any way. Coal mining always has the potential to result in underground fires, but there has not been any incidence of underground fires associated with the adjacent mining operations.

The unlikely and limited potential subsidence that could result if the RFDS were implemented could cause a fire related to existing or future gas wells, pipelines, and electrical lines; however, significant subsidence is not predicted, nor have any similar impacts occurred at nearby existing coal mining operations in recent history. Based on the information summarized above, the expected potential impacts to this resource are not considered significant.

If oil and gas development does increase, increased access via drill roads would allow more opportunity for uncontrolled, illegal timber harvest and ORV use, which would increase the fire hazard.

3.5.2d Impacts–No Action Alternative

If the No Action Alternative is selected and the NAS is implemented, no mining would occur under the proposed lease tracts. On-going activities under the current management system would continue. Oil and gas development, legal and illegal ORV use, and hiking would continue on the surface of the proposed lease tracts.

3.5.2d1 Upland, Wetland, and Riparian Vegetation Communities

Under the No Action Alternative, direct or indirect impacts to vegetation on the proposed lease tracts would be the same as those experienced under the existing normal operating conditions. No significant impacts are expected as a result of the No Action Alternative.

3.5.2d2 Forestry and Woodland Products

Under the No Action Alternative and associated NAS, forestry and woodland products would continue to be managed under the existing plans. Illegal harvest, theft, or damage to this resource would likely continue at about the same rate as in recent years, and commercial harvest of forest or woodland products could occur under the existing plans. The volume, locations, acreages and schedule for future potential timber harvests are not known. No significant impacts are expected under the No Action Alternative.

3.5.2d3 Wildland Fire Ecology and Management

Under the No Action Alternative and NAS, wildland fire ecology and management would continue to be managed under the existing plans. Wildfire incidents would continue at about the same rate as they have in recent years. Most fires would be the result of either human activity or lightning as they have in the past and the impact to wildfire ecology and management would likely continue at about the same rate as in recent years. No significant impacts are expected under the No Action Alternative.

On-going activities on the surface of the proposed lease tracts, including ORV use and oil and gas development, would continue under the No Action Alternative and NAS. These impacts are assessed in chapter 4 (Cumulative Effects).

If oil and gas development does increase, increased access via drill roads would allow more opportunity for uncontrolled, illegal timber harvest and ORV use, which would increase the fire hazard.

3.5.2e Mitigation Measures

No significant impacts are predicted under the Proposed Action or No Action Alternative, and no mitigation measures are required.

3.5.2f Residual Impacts

Because no significant impacts are expected for vegetation communities, no residual impacts are predicted.

3.5.2g Monitoring Recommendations

No impacts are expected, so no monitoring is required.

3.6 FISH AND WILDLIFE RESOURCES

Animals often are described based on their habitat. Animals that live in the water are referred to as "aquatic wildlife," and animals that live on land are referred to as "terrestrial wildlife" or sometimes simply "wildlife." Biologists often use a group of animals that is sensitive to changes in conditions in a given environment, referred to as an "indicator group," to describe and measure impacts to the wildlife in that environment. For example, fish often serve as indicator species for assessing impacts to aquatic wildlife. Similarly, biologists sometimes use groups of terrestrial animals, such as game animals, as an indicator group to describe or measure impacts to terrestrial wildlife.

3.6.1 Affected Environment

The fish and wildlife study area includes all of the area within the outer boundary of the proposed lease tracts, and includes the stream corridors in between each of the lease tracts. Using this uninterrupted boundary allows the analysis to address riparian habitat that would have been omitted had only land within the proposed lease tracts been described. The study area is the same as the soil study area (figure 3.4-1).

Factors that describe the condition of fish and wildlife in the vicinity of the proposed lease tracts include gill-net surveys of open-water fish species for the lake from 2001 to 2005 (WVDNR 2006), and harvest statistics (that is, gun and bow) of white-tailed deer (*Odocoileus virginianus*) for the USACE East Lynn Lake Project from 2001 to 2005 (WVDNR 2005). No trends were evident for either the fish surveys or deer harvest statistics.

Populations of fish and wildlife on the proposed lease tracts are generally considered acceptable (USACE 1984). Twenty-nine species of fish have been identified in the lake (USACE 2007c), which supports a warmwater fishery. The WVDNR stocks the lake with game fish. Several game fish occur in the lake including largemouth bass (*Micropterus salmoides*), spotted bass [*Micropterus punctulatus* (AFS), *Dicentrarchus punctatus* (vernacular)], hybrid striped bass (*Morone saxatilis x Morone chrysops*), walleye (*Sander vitreus*), saugeye (*Sander vitreus x Sander canadense*), channel catfish (*Ictalurus punctatus*), muskellunge (*Esox masquinongy*), and bluegill (*Lepomis macrochirus*). The water that is released at the toe of a dam is referred to as the tailwaters. The tailwaters below the East Lynn Lake dam is stocked with trout monthly from February through May. The trout species are mostly rainbow trout (*Oncorhynchus mykiss*) from hatcheries, but may also include brown trout (*Salmo trutta trutta*) and brook trout (*Salvelinus fontinalis*). The East Lynn Lake dam tailwaters are a put-and-take fishery, because most individuals do not survive through the whole year–or do not oversummer–in the tailwaters (Brown 2007).

The fishery resource potential in the lake is considered to be hindered by poor to fair water quality from a fishery standpoint (USACE 1984). Low dissolved oxygen and high iron concentrations, at depths of 15 feet and greater during the summer, restrict optimum sport fish production in the lake (USACE 1977).

A database has been created from the WVDNR 2001 to 2005 gill-net survey of the fisheries in West Virginia reservoirs, including the lake (WVDNR 2006). This database will allow WVDNR biologists to

analyze data, search through multiple years, and compile trends which may not have been evident otherwise. A fishery monitoring program of reservoirs previously sampled will be established. The overall goal of these studies will be to provide reliable information in order to make correct management decisions to improve the quality of the reservoir fisheries in West Virginia (WVDNR 2006).

As for forest wildlife, habitat on the proposed lease tracts is considered of good to excellent quality, providing food and cover for several hundred vertebrate species (Dotson 1992). The secondary growth forest of primarily young and moderate-sized trees with occasional openings provides suitable habitat to support moderate populations of most common game species (USACE 1984). The forest in the vicinity of the proposed lease tracts is somewhat fragmented. Several dirt and paved roads and utility rights-of-way cross the proposed lease tracts.

Wildlife on the proposed lease tracts has been categorized by habitat (USACE 1974b). **Open land wildlife** refers to species that live in cultivated areas, pastures, meadows, shrubs, fence rows, and open areas overgrown with grasses and shrubs. Representative species include bobwhite quail (*Colinus virginianus*), mourning dove (*Streptopelia decipiens*), woodchuck (*Marmota monax*), and eastern cottontail rabbit (*Sylvilagus floridanus*). **Forest wildlife** includes ruffed grouse (*Bonasa umbellus*), wild turkey (*Meleagris gallopavo*), white-tailed deer, black bear (*Ursus americanus*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), raccoon (*Procyon lotor*), and red fox (*Vulpes vulpes*). **Wetland wildlife** includes ducks, wading birds, muskrat (*Ondatra zibethicus*), mink (*Neovison vison*), and beaver (*Castor canadensis*).

The major harvested forest game species in the area are white-tailed deer, wild turkey, gray squirrel, ruffed grouse, and raccoon. Black bear, cotton-tailed rabbit, fox squirrel, red fox, gray fox (*Urocyon cinereoargenteus*), mink, muskrat, beaver, woodchuck, American woodcock (*Scolopax minor*), Canada goose (*Branta canadensis*), and wood duck (*Aix sponsa*) are also hunted (Dotson 1992).

In order to improve the USACE East Lynn Lake Project habitat for game species, brushland has been maintained and some open land has been mowed or planted in game food. Wood duck boxes and goose nesting structures have been constructed. To create wetland habitat, beavers have been introduced (Dotson 1992).

Also moderately abundant in the proposed lease tracts are nongame species of birds, herptiles, and mammals (USACE 1984). About 95 bird species likely breed in the proposed lease tracts. For Wayne County, 49 species of amphibians and reptiles have been reported (USACE 1974b). Amphibians include 15 salamander species, 12 toads and frogs, and reptiles include 5 turtles, 4 lizards, and 13 snake species. Approximately 35 to 40 species of mammals are likely to occur in the USACE East Lynn Lake Project area (USACE 1974b). The proposed lease tracts do not have much potential to support rare species of wildlife (Dotson 1992).

Wildlife species that require forests in the early stages of succession have been declining as the timber stands mature. In time, disturbed lands on the USACE East Lynn Lake Project area will succeed back to mature forest (Dotson 1992). As this vegetation advances through stages from field to mature forest, there will be concurrent changes in wildlife populations. As the scattered fields revert to forest through natural succession, habitat diversity will be reduced to the detriment of open land wildlife species (USACE 1974a).

Current activities such as ORV use may directly affect wildlife through incidental vehicle collisions with wildlife such as ground birds and deer. Current activities such as construction, maintenance, repair, and collection activities associated with oil and gas wells may cause indirect impacts such as soil compaction and erosion, which could reduce vegetation productivity, affecting wildlife habitat and food sources. Recreational activities can indirectly impact vegetation by compacting soils to the point where plants cannot grow, impacting wildlife habitat and food sources. A photograph of an area on the USACE East Lynn Lake Project impacted by ORV use is included in appendix C (photograph C-5).

3.6.2 Environmental Consequences

3.6.2a Scoping Issues

The single issue recorded in the public scoping process with regard to wildlife resources addressed impacts of the Proposed Action on rare terrestrial species.

3.6.2b Significance Criteria

Modifications of the physical geography or hydrology of the proposed lease area can impact biological resources, including wildlife and fish. Impacts to soil, surface or groundwater, or vegetation may result in direct or indirect impacts to fish and wildlife, including Proposed, Endangered, Threatened and Sensitive (PETS) species, through alteration of their habitat. Potential impacts of the Proposed Action would be considered significant if there would be a measurable change in fish or wildlife population abundance due to any of the following:

- impacts to soils, such as loss of soil due to erosion or reduction of soil productivity, that cause significant vegetation losses
- impacts to surface water or groundwater (due to reduction in quantity, flow or quality) that would result in a decrease in aquatic habitat quality,
- long-term (greater than 5 years) loss of forest vegetation (terrestrial habitat) that would result in decrease in habitat availability
- long-term (greater than 5 years) modification or degradation of forest vegetation (terrestrial habitat) that would result in a decrease in habitat quality,
- disruption of fish or wildlife breeding or nesting activities to the extent that reproductive success is impaired,
- reduction in viability of any species through direct mortality or behavioral disruption
- taking of any PETS species without a permit, through habitat loss or otherwise (addressed in section 3.7)

3.6.2c Impacts–Overview

General effects of habitat modification on fish or wildlife could include direct mortality, disturbance, physical loss or fragmentation of habitat, displacement, and impacts to PETS species. These effects can be classified as short-term (less than 5 years) or long-term (5 to 20 years). Short-term impacts could be related to modification or degradation of localized parcels of habitat. Long-term impacts would be related to permanent changes to fish or wildlife habitats and the populations dependent on these communities.

3.6.2d Impacts–Proposed Action (Preferred Alternative)

Direct impact on terrestrial vegetation resources would be limited to a maximum of 20 acres of surface disturbance over the 13,000 acres of proposed lease tracts (approximately 0.15 percent of the total surface area), affecting very small areas of a few acres each in any specific location. Impacts to soils, such as loss of soil due to erosion or reduction of soil productivity, which in turn would cause vegetation losses, would be minimal. There would be no measurable change in wildlife population abundance associated with this limited decrease in habitat availability and quality. Consequently, selection of the Proposed Action and implementation of the RFDS would not have direct effects on the ecological function of the terrestrial habitats present on the surface of the proposed lease tracts.

Impacts from the Proposed Action and RFDS would otherwise be mainly a result of changes in hydrological regime, water quality, and subsidence. Protective barriers would be retained between the proposed mining activity and water resources, and impacts to the hydrological regime are expected to be limited (sections 3.2 and 3.3, Water Resources). Very minimal impacts to stream flows, groundwater levels in the riparian areas, and water quality in surface streams and the lake would be expected, causing negligible impacts on aquatic communities.

Potential impacts to aquatic habitats and fish species in the lake and associated streams could result if increased sediment loads or acid mine drainage were caused by implementation of the RFDS. However, only limited surface disturbance is expected, so no increase in sediment loading is expected (sections 3.2, Surface Water and 3.4, Soils), and acid mine drainage (section 3.3, Groundwater Resources) is not expected to occur. There would be no measurable changes in fish populations associated with the predicted changes in aquatic habitat quality. Thus, for fish and other aquatic organisms found in the lake and in associated streams, no direct impacts are expected.

Subsidence could potentially cause surface disturbance (*see* section 3.1, Minerals subsection under Geology) and directly impact vegetation and indirectly impact wildlife. Because of the room-and-pillar mining methodology and the thick sandstone layers in the overburden, little to no subsidence is expected. Fish and wildlife habitat would not be affected and there would be no direct mortality or indirect reduction in population viability. Consequently, no impacts to fish or wildlife resources are expected under the Proposed Action and RFDS.

3.6.2e Impacts–No Action

If the No Action Alternative is selected, the coal under the proposed lease tracts would not be mined and the conditions affecting fish and wildlife that currently exist would remain unchanged. Therefore, no direct or indirect effects to fish and wildlife are expected if the No Action Alternative is selected and the NAS is implemented.

3.6.2f Mitigation Measures

Because no significant impacts have been identified, no specific mitigation is expected to be necessary for the protection of fish and wildlife if either the Proposed Action or the No Action Alternative is selected.

3.6.2g Residual Impacts

No mitigation measures are expected to be required, and no specific residual impacts to wildlife or fish resources have been identified.

3.6.2h Monitoring Recommendations

No significant impacts are expected, and no monitoring recommendations are considered necessary.

3.7 PROPOSED, ENDANGERED, THREATENED, AND SENSITIVE SPECIES

The *Endangered Species Act* (ESA) protects plant and wildlife species that are at risk of becoming extinct. The ESA requires resource managers to identify and protect plant or wildlife species that are listed as endangered or threatened, proposed for listing or candidates for listing under the ESA.

The USFWS maintains regional lists of species and/or habitat along with the status of those species. Other federal land management agencies including the BLM and U.S. Forest Service (USFS) maintain lists of species that could become listed in the future (Sensitive species). The BLM policy requires that actions approved by the BLM do not contribute to the need to list sensitive species under the ESA. Federally listed and sensitive species are known collectively as Proposed, Endangered, Threatened and Sensitive (PETS) species.

At the state agency level, a network of Natural Heritage Programs (NHPs) exists throughout the country. These NHPs maintain lists of species considered to be endangered, threatened, or rare and use the Heritage Program Network Ranking System to prioritize the need for protection. Although the NHP lists are non-binding, resource managers may use them as guides when assessing impacts. Table 3.7-1 presents the Heritage Network Ranking System ranks and their definitions.

Table 3.7-1
Heritage Network Ranking System for Species at Risk
at the Global or State Level

Rank	Interpretation
G1 or S1	**Critically Imperiled**–Critically imperiled because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation or extinction. Typically 5 or fewer occurrences or less than 1, 000 remaining individuals.
G2 or S2	**Imperiled**–Imperiled because of rarity or because of some factor(s) making it very vulnerable to extirpation or extinction. Typically 6 to 20 occurrences or between 1,000 and 3,000 remaining individuals.
G3 or S3	**Vulnerable**–Vulnerable either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation or extinction. Typically 21 to 100 occurrences or between 3,000 and 10,000 remaining individuals.
G4 or S4	**Apparently Secure**–Uncommon but not rare, and usually widespread. Possible cause of long-term concern. Usually more than 100 occurrences and more than 10,000 individuals
G5 or S5	**Secure**–Common, widespread, and abundant. Perpetually secure under present conditions. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

Notes: G=Global, S=State
Source: CNHP 2007

The BLM does not manage any land surface in West Virginia, so the BLM has no sensitive species list for West Virginia. The BLM typically uses USFWS information, along with its own sensitive species list and any state agency information received, such as the NHP list, to identify sensitive species in a given area. On December 15, 2006, the BLM submitted letters to the USFWS and WVDNR requesting lists of PETS species within the proposed lease tracts.

On January 10, 2007 the BLM received a response letter from USFWS indicating that because no surface disturbance would occur, no federally listed species would be impacted by the proposed project. Subsequently, the BLM requested any other available information on reported occurrences of PETS species in the vicinity of the proposed lease tract (Wendlandt 2007a). During the conversation, USFWS indicated that the single species that might be impacted is the Indiana bat (*Myotis sodalis*).

On February 9, 2007, the BLM received the USFWS table *Federally Listed Endangered and Threatened Species in West Virginia (Revised October 2006)* (Johnson-Hughes 2007). This table lists 20 species by scientific or taxonomic name, common name, status, and geographic distribution. None of the 20 listed species, including the Indiana bat, have been reported in Wayne County, West Virginia. However, potential summer forested habitat for the Indiana bat exists throughout West Virginia (USFWS and others 2007).

The WVDNR manages lands in the state, but the agency does not have an official list of special status species. The agency does maintain a database of rare, threatened and endangered (RTE) species occurrence records, and a list of Species of Greatest Need of Conservation (WVDNR 2003).

At the regional level, some local plant or wildlife societies maintain additional information on special status species.

3.7.1 Affected Environment

3.7.1a PETS Plant Species

On December 27, 2007, the BLM received a response letter from the WVDNR stating that their RTE species occurrence records (Sargent 2006) indicated that two plant species–creeping cucumber (*Melothria pendula*) and little-headed nutrush (*Scleria oligantha*)–were located in the vicinity of the proposed lease tracts. Both plant species are classified by the Heritage Network Ranking System S1 and G5, as defined in table 3.7-1 indicating that they are both at least locally rare.

Another source of information on reported occurrences of species of concern is the West Virginia Native Plant Society (WVNPS). The WVNPS conducted a wildflower survey of the USACE East Lynn Lake Project between the years 2000 and 2006 (WVNPS 2007), and developed a species list. Resource specialists compared the WVNPS 2007 species list to the WVDNR Wildlife Diversity Program's Heritage Network System species list to obtain the ranking information for species included on the WVNPS list. Based on that comparison, the WVNPS wildflower survey indicated that seven ranked species had been observed on the proposed lease tracts (table 3.7-2).

Table 3.7-2
Ranking Information for Species
Included on the WVNPS List

Common Name	*Scientific Name*	State Rank	Global Rank
Vervain thouroughwort	*Eupatorium pilosum*	imperiled (S2)	secure (G5)
climbing fern	*Lygodium palmatum*	imperiled (S2)	apparently secure (G4)
slender ladies'-tresses	*S. lacera* var. *lacera*	critically imperiled (S1)	secure (G5)
little ladies'-tresses	*S. tuberose*	imperiled (S2)	secure (G5)
twisted ladies'-tresses	*S. vernalis*	critically imperiled (S1)	secure (G5)
Nuttall's hedge nettle	*Stachys nuttallii*	vulnerable(S3)	secure (G5)
filmy fern	*Trichomanes boschianum*	critically imperiled (S1)	apparently secure (G4)

In summary, no plants reported in the vicinity of the proposed lease tracts are federally listed. Nine plant species that have been reported in the vicinity of the proposed lease tracts are included on the WVDNR Wildlife Diversity Program's Heritage Network System species list. The nine plant species that have been reported in the vicinity of the proposed lease tracts and are listed as rare are described below, along with the existing conditions for these species.

Vervain thouroughwort (*Eupatorium pilosum*), also known as rough boneset, ranges across the entire eastern seaboard, except Vermont, New Hampshire and Maine (NRCS 2007). It is an aster with white flowers that bloom between July and September and is found in moist areas along the margins of ponds, in sandy soils, savannas and ditches (Flora of North America 1993 v26).

Climbing fern (*Lygodium palmatum*) is a vine, as the common name implies. Its distribution covers nearly the entire eastern U.S. The species is found in acidic soils and is shade intolerant (Flora of North America 1993 v2).

Creeping cucumber (*Melothria pedula*), is also known by the common names Guadeloupe cucumber and Squirting cucumber. No description of habitats for creeping cucumber in West Virginia was found. Creeping cucumber is a slender annual vine, found in thin woods, thickets at edges of swamps and on hummocks, often occurring in large numbers on disturbed ground throughout the Southeastern U.S. as far north as southern Kansas in the west and Pennsylvania in the east (Reed 2002). In North Carolina creeping cucumber is found in forest or natural areas, in low woods, fields, thickets, and marshes. The species may be prolific or be viewed as weedy in disturbed areas such as roadsides and fields (Russell 2007). Recent records of this species in southern Illinois, usually found in rich or damp thickets and gravelly streambeds, have revealed that this species is vigorous and competes well with other vegetation in mowed areas such as lawns and power line ROWs. Creeping cucumber also appears to be vigorous in damp thickets where disturbance opens the canopy allowing more sunlight to reach the herbaceous layer (USFS 2003). In Florida the species is found in habitats ranging from upland mixed hardwood to wooded riversides and swamps (ISB 2007). Creeping cucumber may be present on the proposed lease tracts, as potential habitat exists.

Little-headed nutrush (*Scleria olegantha*) habitat in Ohio is xeric oak barrens with dolomite- or limestone-based soils (USFS 2005). Two current occurrences on the Wayne National Forest (Ohio) occur in fire-managed areas. Due to the acidic soils on the proposed lease tracts, this species is not likely to be present.

Three orchid species within the genus *Spiranthes* were found on site: **slender ladies'-tresses** (*S. lacera* var. *lacera)*, **little ladies'-tresses** (*S. tuberose*), and **twisted ladies'-tresses** (*S. vernalis*). Little ladies'-tresses and twisted ladies'-tresses have a geographic range of the southeastern U.S. as far west as Texas, while slender ladies'-tresses ranges further north up into Canada (NRCS 2007). These orchids are recognizable by white flowers and broad leaves. Leaves are short-lived in little ladies'-tresses. All three species are found in dry to open woodlands, and open lands such as outcrops, roadsides and cemeteries. In the far southern extent of its range, twisted ladies'-tresses can flower as early as January, while the other two species flower from spring to autumn.

Nuttall's hedge nettle (*Stachys nuttallii*, or *S. cordata*), or heartleaf hedge nettle, has been reported as rare in Maryland, where the species is found in the mountains (Brown and Brown 1984). It prefers mesic forests. The flowers are white to pinkish and in bloom between June and July. Its range extends from New York to Georgia and as far west as Arkansas (NRCS 2007).

Filmy fern (*Trichomanes boschianum*), also known as bristle fern, is endemic to the eastern U.S., ranging from Mississippi to Ohio and as far west as Arkansas along climatically moderate climates (Flora of North America, 1993, v2). According to the Ohio Department of Natural Resources, where the species

has been listed as endangered since 1980, filmy fern is found in deep shade on moist non-calcareous rock (Cusick 1983). This species has been documented as having high mortality to sporadic drought, and is slow to re-grow.

Under the current management situation on the USACE East Lynn Lake Project, surface disturbance is limited to designated areas. Although unauthorized activities may damage or destroy individual plants and/or their habitat, minimal impact occurs to populations of sensitive plants on the proposed lease tracts.

The status of existing PETS plant species and any indicators of loss of the species or its habitat are appropriate indicators of the current condition. There are no federally listed species known on the proposed lease tracts, and nine species listed as rare by the WVDNR have no federal or state status have been reported in the vicinity of the proposed lease tracts. As described in section 3.5 (Vegetation Resources), historical surface disturbance such as ORV recreational use, oil and gas well, pipeline, or access road construction, maintenance, or repair, or mineral exploration activities that have remained unremediated have the potential to directly and indirectly impact vegetation, including plant species of concern.

Reclamation of adjacent mined lands has resulted in extensive acreages of nuisance and exotic species which would, in the long-term, compete with native plants and assemblages within East Lynn Lake Project lands.

Current activities which may affect plant species of concern include recreational activities (hiking and ORV use), and construction, maintenance, repair, storage, and collection activities associated with oil and gas wells. These potential impacts would be offset somewhat as existing forest stands mature and provide greater vegetation cover, which would reduce erosion losses. In the absence of other activities, this trend would be expected to increase the old growth component, while reducing the permanent openings. The existing populations of plant species of concern are expected to remain stable. Potential loss of individuals may occur related to recreational activities or oil and gas exploration and development. However, because all identified species are considered secure, or apparently secure, globally (G4 or G5 level, table 3.7-1), the loss of individuals would not indicate a significant downward trend on the species as a whole.

3.7.1b PETS Animal Species

No animal species reported in the vicinity of the proposed lease tracts are federally listed. One federally-listed animal species, the Indiana bat (*Myotis sodalis*), has been noted as a species whose habitat might be impacted by surface disturbance (Wendlandt 2007a). A conservation action plan has been developed for the Cerulean Warbler (*Dendroica cerulea*) by the USFWS (2007d).

3.7.1b1 Indiana Bat

The Indiana bat is included on the WVDNR Species of Greatest Need of Conservation list for mesophytic forest and the list for oak/hickory and dry/mesic oak forest (WVDNR 2003a). However the Indiana bat has not been reported in Wayne County (Johnson-Hughes 2007a).

Compliance Monitoring and Labs, Inc. (2005, 2006a, 2006b, 2006c, 2006d) has performed bat surveys on several of Argus' existing surface mines in the vicinity of the proposed lease tracts:

- At the Pretty Branch Surface Mine, located 39 miles southwest of Charleston, two eastern pipistrelles (*Pipistrellus subflavus*) were captured. No federally listed bat species were captured.
- At the Copley Trace No. 2 Surface Mine, located 3 miles northeast of Breeden, West Virginia, no bats were captured.
- At the Rollem Fork No. 2 Extension, located about 35 miles west of Harris, West Virginia, no bats were captured.
- At the Jim's Branch Surface Mine, located about 5 miles northeast of Breeden, West Virginia, no bats were captured.
- At the East Fork South Surface Mine, located about 4 miles northeast of Wilsondale, West Virginia, three eastern pipistrelles and one Eastern red bat (*Lasiurus borealis*) were captured. No federally listed bat species were captured.

In total, six bats were captured, none of which are federally listed.

Factors that contribute to describing and defining the condition of the Indiana bat population in West Virginia include counting the number of hibernating bats during the winter in caves, sandstone shelters, and abandoned mines. Potentially occupied summer and/or winter habitat for the Indiana bat may exist within any proposed mining permit area in West Virginia (USFWS 2007c). West Virginia is on the edge of the range of this species, but significant numbers of these bats hibernate in certain West Virginia caves. This bat has been reported from caves in the eastern highlands of the state. During the 2005 winter counts, 12,677 hibernating Indiana bats were observed in West Virginia (USFWS 2007c).

Indiana bat hibernacula surveys indicate that the winter population in West Virginia has been increasing slightly since 1990 (Beverly and Gumbert 2004). Recent public education and installation of bat-friendly cave gates or fences may be resulting in less disturbance of most known hibernacula, which may in turn be contributing to the increase in population. Higher population counts have been reported primarily at historic hibernation sites, although documentation of new caves within the state has also played a small role.

The disturbance of winter hibernacula is believed to be one of the major reasons for past declines of the Indiana bat (USFWS 1999, as cited in Beverly and Gumbert 2004). Thus, protection of these habitats has become a top priority for federal and state wildlife and land management agencies (USFWS 1999).

Until 1995, the Indiana bat was not documented as a summer resident of the state. During the summer of that year, a few male Indiana bats were captured in Tucker County in northern West Virginia (WVDNR 2003a). The summer habitat of this species was almost unknown until recently, and it is still poorly understood. During the summer, females form small colonies under the loose bark of trees, where they raise their young. Males also appear to form small colonies in trees, either in hollow trees or under loose bark. Feeding areas for the Indiana bat consist of wooded habitats. Early studies indicated that wooded areas along rivers were the preferred feeding areas, but more recent studies suggest that upland forests are also used (WVDNR 2003a).

Regionally, the Indiana bat seems to be recovering, but populations in some mid-western caves are still declining, even where the cave is protected. This decline suggests that there may be problems in the bats'

summer habitats. Much still needs to be learned concerning the summer requirements of this species (WVDNR 2003a).

3.7.1b2 Cerulean Warbler

The Cerulean Warbler is a small neo-tropical migrant songbird that breeds in eastern North America and winters in middle elevations of the Andes Mountains in northern South America. The Cerulean Warbler is protected by the *Migratory Bird Treaty Act* (16 USC 703-712). This species has specific habitat preferences on both the breeding and wintering grounds, largely associated with mature forests having structurally diverse canopies with multiple vegetation layers.

Cerulean Warblers have experienced a long-term population decline. Analysis of North American Breeding Bird Survey data indicates that over the last 40 years, the decline has been steep and steady at a rate of about -3.0 percent per year.

Primary limiting factors for this species are thought to be habitat loss and degradation on its wintering and breeding grounds. Initial studies of demographics and population ecology for this species suggest that population growth could be limited by a combination of poor survival during the non-breeding period and poor reproductive success during the breeding period. The loss, fragmentation, and degradation in quality of eastern North American forests represent a threat to this species' reproductive success. Recent and on-going studies are documenting poor reproductive success for this species in areas with low overall forest cover and high degrees of forest fragmentation. In addition, there is concern that many eastern forests might not contain the kind of vegetation structure preferred by Cerulean Warblers, thereby limiting the suitability of those forests as breeding habitat and contributing to reduced reproductive output.

Forest loss and forest fragmentation are often closely tied, as areas that have sustained substantial forest loss are the ones where forest fragmentation is likely to be a problem. Forest fragmentation is a threat because of the strong demonstration of increased nest predation and nest parasitism rates on forest songbirds within fragmented landscapes.

To conserve the species, one of the primary goals is to reduce forest fragmentation and prevent major forest loss on the breeding grounds. This goal can be accomplished through reducing the amount of mature timber cleared and planting with native tree species after surface disturbance, such as surface mining, logging, or other activities (USFWS 2006).

3.7.2 Environmental Consequences

3.7.2a Scoping Issues

3.7.2a1 PETS Plant Species

One scoping comment requested that rare terrestrial plant species be considered.

3.7.2a2 PETS Animal Species

The single issue recorded in the public scoping process that addressed wildlife resources related to impacts of the Proposed Action on rare terrestrial animal species.

3.7.2b Significance Criteria

3.7.2b1 PETS Plant Species

Significant impacts to PETS plant species would occur if there would be:

- any taking of federally Proposed, Endangered, or Threatened species, or
- loss of rare species that are likely to contribute to the need for federal listing.

3.7.2b2 PETS Animal Species

Modifications to the physical geography and hydrology can impact other resources, including PETS species. Impacts to soils and vegetation could result in indirect impacts to wildlife, including PETS species, through alteration of habitat. In assessing potential impacts to PETS species, significant impacts may occur if there would be:

- significant impacts to soils, such as losses of soil due to erosion or loss of soil productivity, that cause vegetation losses to PETS species habitat
- long-term (greater than 5 years) loss of forest vegetation (terrestrial habitat) that would result in a determination of "likely to adversely affect" for a Threatened, Endangered or Proposed species under the *ESA*
- taking of any PETS species without a permit, through habitat loss or otherwise, and/or
- reduction in viability of any species for which a USFWS Conservation Action Plan has been or is being drafted.

3.7.2c Impacts–Proposed Action (Preferred Alternative)

Design features or management practices which are intended to avoid or reduce environmental harm to water resources, soils, vegetation, and the habitat those resources create, have been incorporated into the RFDS. These practices include 200-ft barriers around the perimeter of the lake, and 150-ft barriers between the mine and those areas where the coal seam outcrops at the surface (BLM 2009).

3.7.2c1 PETS Plant Species

There are no known occurrences of federally listed (Proposed, Threatened or Endangered) plant species in Wayne County. Thus, there is no potential to impact federally listed plant species. There is potential for loss of individuals of any of the nine rare species listed in section 3.7.1a above during clearing of vegetation for surface activities. A maximum of 20 acres of surface disturbance is expected if the RFDS is implemented. There is a small possibility that a rare plant species could be present in the cleared area. However, because these nine species are all considered globally secure, the loss of individuals would not constitute a significant impact to viability of any of the species. As described in section 3.1 (Geology and Mineral Resources), minimal to no subsidence is predicted. As described in sections 3.2 and 3.3 (Water Resources), no changes to hydrology are expected that would impact terrestrial vegetation. Therefore, indirect impacts related to subsidence or changes in hydrology are unlikely. Clearing of vegetation related to surface disturbance may have a beneficial effect on two species (creeping cucumber and climbing fern) which prefer openings related to disturbance.

3.7.2c2 PETS Animal Species

If the Proposed Action is selected and the RFDS is implemented, activities associated with the proposed underground coal mining are not expected to impact more than a total of 20 surface acres. Surface disturbance may occur in small patches for the construction of ventilation shafts, rescue shafts, or exploration coreholes. No large, continuous areas of forest would be cleared.

During the public scoping process, the issue of project impacts on rare terrestrial wildlife species was identified as an issue of concern. The single federally Threatened, Endangered or Proposed wildlife species known to occur within the vicinity of the proposed lease tracts is the Indiana bat. In West Virginia, removal of up to 40 acres of forested habitat associated with surface mining activities has been determined to not adversely affect Indiana bats when the activities occur outside of known summer habitat (WVDNR 2007). In a letter dated July 12, 2007, the USFWS concluded that the proposed lease tracts are located outside of known Indiana bat winter or summer habitat, and determined that the bat would not be affected by the Proposed Action or RFDS (Johnson-Hughes 2007b).

In addition, a conservation action plan has been developed for the Cerulean Warbler (*Dendroica cerulea*) by the USFWS (USFWS 2007d). However, according to the USFWS (USFWS 2007), the surface disturbance on the proposed coal leases would not remove Cerulean Warbler habitat, nor cause the population to decline at a faster rate.

Therefore, under the Proposed Action, no effects are predicted for PETS wildlife species.

3.7.2d Impacts–No Action

Under the No Action Alternative, direct or indirect impacts to PETS plant species would be the same as those experienced under the current operating conditions. No significant impacts are expected under the No Action Alternative.

3.7.2e Mitigation Measures

No significant impacts to PETS plant or animal species are expected under the Proposed Action or No Action Alternative. Therefore, no mitigation is required.

3.7.2f Residual Impacts

No significant impacts are expected under the Proposed Action or No Action Alternative, and no residual impacts are expected.

3.7.2g Monitoring Recommendations

3.7.2g1 PETS Plant Species

In accordance with NEPA requirements, any area planned to be disturbed for surface facilities would be surveyed for the presence of PETS plants prior to surface disturbance activities.

3.7.2g2 PETS Animal Species

Since no residual impacts have been identified, no monitoring for PETS animal species is deemed necessary. However, the need for site specific monitoring procedures would be re-evaluated and determined again in the future, depending on permitting requirements for the mine plan.

3.8 SOCIOECONOMIC RESOURCES

Socioeconomic resources are resources that provide social or economic value to, and are currently available to, regional and local communities. Examples include:

- heavy industrial businesses such as mining, forestry, or construction,
- light industrial businesses such as transportation or warehousing,
- agriculture,
- commercial businesses such as retail stores,
- services such as hospitals and other health care facilities, and tourism businesses,
- developed natural resource uses such as flood control and recreation facilities, and
- social organizations such as churches, 4H, the Community Educational Outreach Service, and scouting organizations.

Socioeconomic indicators are factors that can be used to measure the effects that proposed project alternatives may have on different resource conditions, and the magnitude of any change from current conditions. Examples include:

- statistical characteristics of human populations (referred to as demographic information) such as population size, in-migration and out-migration, housing information, schools and education levels,
- economic numbers concerning employment, income, and earnings,
- federal, state, and county tax revenue,
- social values that may affect community response to project impacts, and
- community organizations and services.

As part of the NEPA process, specialists prepared a socioeconomic baseline assessment and social impact analysis (BLM 2008b). More detailed data on socioeconomic resources are available in this document.

3.8.1 Affected Environment

The proposed lease tracts are located in the southwestern part of West Virginia, near the eastern borders of the states of Kentucky and Ohio. Nearby communities include East Lynn, Dunlow, Kiahsville, and Cove Gap. The larger town of Wayne, the county seat, is located about 6 air miles to the northwest. The socioeconomic study area for this FLUA/FEIS is the area within Wayne County, as shown on figure 3.8-1.

While the U.S. Census Bureau reports demographic statistics for Wayne County, data on the affected small communities that are not incorporated are unavailable. Additional data for Wayne County are available as part of the Huntington-Ashland-Ironton metropolitan statistical area (MSA) and also as part

of the Appalachian Regional Commission (ARC). Current business data are available from the Huntington Area Development Council (HADCO), and additional data have been acquired by contacting local agencies. For economic projections, ARC, the West Virginia Development Office (WVDO), and Wayne County documents, along with studies from the nearby University Centers for Business and Economic Research (CBER) provide data to understand likely development scenarios for Wayne County.

3.8.1a Socioeconomic Setting of the East Lynn Lake Project

Data on the socioeconomic setting of Wayne County and the East Lynn Lake Project are reported for several geographic and statistical areas. Major reporting areas include the Huntington-Ashland-Ironton WV-KY-OH MSA, the area represented by HADCO, the ARC, the State of West Virginia, and Wayne County.

3.8.1a1 Huntington-Ashland-Ironton, WV-KY-OH Metropolitan Statistical Area

Huntington, part of which is in Wayne County, is one of the major cities in the southwestern portion of West Virginia and part of the more urbanized region of the Ohio Valley. In 1966, the U.S. Census Bureau designated the urbanized area of the Huntington-Ashland-Ironton WV-KY-OH MSA. Figure 3.8-2 shows all of the MSAs for West Virginia. The Huntington-Ashland-Ironton MSA includes towns and counties and towns from three states (KYOVA 2007):

- Cabell and Wayne Counties and the city of Huntington in West Virginia
- Lawrence County and the city of Ironton in Ohio
- Boyd County, Carter County, the town of Green Up, and the city of Ashland in Kentucky

As of the 2000 census, the Huntington-Ashland-Ironton MSA had a population of 288,649. As a part of the Huntington Development Area, Wayne County and much of the region depend on employment in the nearby city of Huntington (KYOVA 2002). The KYOVA identifies the following major employers in the Huntington-Ashland WV-KY-OH MSA:

- St. Mary's Medical Center
- Marshall University
- Cabell Huntington Hospital
- CSX Huntington
- GC Services
- Special Metals
- Veterans Administration Medical Center
- Alcon Manufacturing Ltd
- USACE

3.8.1a2 The Huntington Area Development Council

HADCO serves to attract new employers to Cabell and Wayne Counties in West Virginia and to retain existing employers and to help all employers expand their businesses (HADCO 2007).

3.8.1a3 The Appalachian Regional Commission

Socially and economically, West Virginia and Wayne County are closely linked to the larger Appalachian region. The Appalachian Regional Commission (ARC) works in partnership with the states in the region to create opportunities for self-sustaining economic development and improved quality of life. Appalachia, as defined in the legislation from which the ARC derives its authority, is comprised of 410 counties, which includes all of West Virginia and parts of 12 other states: Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia. The Commission uses an index-based county economic classification system to identify and monitor the economic status of the Appalachian counties.

In a study prepared for ARC using 2000 Census data, Pollard (2003) identifies the ways in which the Appalachian region is distinct from the rest of the U.S. The demographics indicate conditions common to the region:

- Although population increased by nearly 2 million persons between 1990 and 2000, the rate of growth remained slower than that of the rest of the nation.
- Racial and ethnic diversity remains virtually nonexistent in nearly half of Appalachia's counties.
- The population is aging earlier than the rest of the country–the median age is higher with fewer children and more elderly.
- Traditional families are less prevalent, likely as a result of this older age structure. There are proportionately more persons living alone, mostly among those 65 years of age or older.
- Based on a variety of economic, labor force, and education measures, these counties still lag behind other American counties: they are less dependent on manufacturing and more dependent on a very diverse service sector.
- Appalachians are more likely to be natives of their home states, and much less likely to have been born in another country.
- Housing vacancy is more common, but so is homeownership. Both owners and renters are more likely to live in affordable housing.
- Though commuting is becoming more common place, commutes remain shorter than in the rest of the U.S.

To apportion ARC funds most effectively, the organization ranks the 410 counties by five economic status designations–distressed, at-risk, transitional, competitive, and attainment–with counties designated as distressed being the counties most in need of improvement. The designations are based on a comparison of county and national averages for three economic indicators: three-year average unemployment rate, per capita market income, and poverty rate (Pollard 2003). Figure 3.8-3 shows the ARC designations for distress for all of West Virginia's counties.

In 2006, Wayne County's risk level was downgraded from the transitional position it held in previous years (ARC 2007), and for the fiscal years 2006-2008, Wayne County is defined as being at the "at risk" economic level. At risk counties are those most likely to become economically distressed. These counties rank among the most distressed 10 to 25 percent of the nation's counties.

3.8.1a4 Overview of West Virginia

West Virginia is noted for its great natural beauty and its historically significant logging and coal-mining industries. One of the major resources in West Virginia's economy is coal. Since 1863, miners have extracted nearly 13 billion tons of coal. In 2005, miners extracted 159.5 million tons of coal in West Virginia, 98.6 million tons of which came from underground operations (WVCA 2006). Although the state is also engaged in oil and gas drilling and production, only a few small- to medium-sized oil and natural gas fields are being developed. Farming and ranching are practiced in West Virginia on a limited basis due to the mountainous terrain over much of the state. The state is also well known as a tourist destination for people interested in outdoor activities such as skiing, whitewater rafting, rock climbing, spelunking, fishing, and hunting.

The economy of West Virginia is one of the most fragile of any U.S. state. According to U.S. Census Bureau data, in 2000 West Virginia ranked third lowest in per capita income, ahead of only Arkansas and Mississippi. It also ranked last in median household income. The proportion of West Virginia's adult population with a bachelor's degree in 2000 was the lowest in the U.S. at 11.9 percent (ARC 2007).

3.8.1a5 Overview of Wayne County

Wayne County currently ranks 13th in the state based on population size (Wayne County 2004). Communities within Wayne County can be divided into regional cities, rural towns, and outlying rural areas. Huntington in Wayne County (2000 population: 51,475) and Charleston in Kanawha County (2000 population: 53,421) are considered regional cities and provide services, shopping alternatives, and diverse amenities for leisure and recreation. However, the larger portion of Huntington is located in neighboring Cabell County. Wayne County's smaller cities/incorporated towns such as Kenova (2000 population: 3,485), Fort Gay (2000 population: 819), and Wayne (2000 population: 1,105) have smaller populations and also serve as employment, shopping, and service areas (U.S. Census Bureau 2000). The town of Wayne is the county seat and hosts the county courthouse, elementary, middle and high schools, a choice of churches, and many businesses.

Based on the population of zip code 25704 that represents the part of Huntington that is in Wayne County, nearly 40 percent of the county population lives in Huntington (2000 population for 25704: 17,017 and 2000 population for Wayne County: 42,903), so that the statistics for Wayne County are clearly skewed toward the metropolitan environment, and understate the rural conditions and poverty found in the portions of Wayne County most affected by the proposed federal coal lease. For this reason, whenever available, statistics for the town of Wayne are included to more closely represent the actual conditions in the vicinity of the proposed lease tracts.

Natural resources are a main source of income to residents of Wayne County, as the local economy relies heavily upon bituminous coal mines, oil and natural gas wells, and the sand and gravel industry. The county also relies upon income generation from livestock, fruit, and tobacco farms (WVCA 2006).

Wayne County has abundant pristine and natural areas, including Beech Fork Lake and State Park in the northern part of the county and Cabwaylingo State Forest in the southern part of the county. Beech Fork Lake and State Park is a 3,144-acre park popular for recreation boating, fishing, hiking, biking, and wildlife watching experiences that is located near Lavalette (WVDNR 2007a). Cabwaylingo State Forest

is comprised of 8,123 acres known for recreational activities including hiking, picnicking, swimming, hunting, fishing, and camping (Marshall University 2005a).

In addition, Wayne County is home to the USACE's East Lynn Lake/WVDNR Wildlife Management Area, a popular location for camping, boating, water-skiing, and trout and warm water fishing. Biking, horseback riding, and hunting for deer, waterfowl, and small game are also available on adjacent public lands. East Lynn Lake is 12 miles long with 1,005 acres of water and 44 miles of shoreline at summer pool level. The USACE East Lynn Lake Project is comprised of a total of 24,821 acres of lands and waters. The WVDNR manages 22,928 acres for fish, wildlife, and forestry management under a license agreement with the USACE (Marshall University 2005b).

Other notable points of interest in Wayne County include Virginia Point Park, Camp Mad Anthony Wayne, Dreamland Pool, Wayne Community Pool, Camden Park (amusement park), Sugarwood Golf Course, Lavalette Golf Course, and Spring Valley Golf Club (Wayne County Economic Development Association 2003).

3.8.1b Social and Economic Conditions–Demographics

3.8.1b1 Population

Longitudinal statistics from 1970-2000 for West Virginia, Wayne County, and the towns closest to the USACE East Lynn Lake Project area are presented in table 3.8-1. The U.S. Census Bureau estimates that the total population in Wayne County for 2006 was 41,647 (U.S. Census Bureau 2007a), down from 42,903 in 2000 (U.S. Census Bureau 2007a). The 2000 population was a 3 percent increase from its 1990 population of 41,636 (U.S. Census Bureau 1990). Between 1970 and 1980 the county grew by over 8,000 people then declines again during the next decade by approximately 4,000 people, with total population ranging between 41,000 and 43,000 people between 1990 and 2000. In 2003 Wayne County ranked 13th in the state based on population size, and was the 34th fastest growing county of West Virginia's 55 counties. The greatest population decline in the region occurred in the years following the Korean War when machines replaced many workers in the coalfields (Wayne County 2004).

In 2000, population for the Huntington-Ashland-Ironton MSA was 288,649. The state's current population is predominantly rural, having the second lowest proportion of persons living in an urban area (WVDO 2003). While a majorityof West Virginia residents (53.9 percent) still live in rural areas, the number is down from 1990 when 63.9 percent lived in rural areas (WVDO 2003). The Rural Policy Research Institute (RUPRI) reports that population growth in West Virginia's metro areas has outpaced the non-metro areas, and non-core counties (rural) account for most of the areas that have lost population 1990-2000 and 2000-2005 (RUPRI 2006). Wayne County is among the counties that have lost population between 2000 and 2004 (WVDO 2005).

The largest communities in Wayne County are Huntington (2000 population: 51,475) and Kenova (2000 population: 3,485) (U.S. Census Bureau 2007a). Both cities lost population between the 1990 and 2000 censuses, but have recently gained with the 2005 populations of 54,844 for Huntington and 3,748 for Kenova (U.S. Census Bureau 2007b). The larger portions of Huntington's geographic area and population are located in neighboring Cabell County. Other incorporated communities in Wayne County are Ceredo (2000 population: 1,675) and Fort Gay (2000 population: 819) (U.S. Census Bureau 2007a).

The three communities closest to the proposed lease tracts, East Lynn to the north, Genoa to the west, and Dunlow to the southwest, are unincorporated and do not have official population statistics. Statistics are available for the zip codes served by the post offices located in these communities. The estimated 2000 population for the community of East Lynn is approximately 1,100 (the population for zip code 25512: 1,752). Genoa had an estimated 2000 population of approximately 300 (population for zip code 25517: 1,703). The postmaster in Dunlow estimates the current population at approximately 340 (population for zip code 25511: 1,105) (Stamper 2007) (Maggard 2007f). The communities south of East Lynn Lake, Kiahsville and Cove Gap, are rural with a combined population of 314 according to the 2000 Census, based on the population of the zip code 25534 (U.S. Census 2007a)

3.8.1b2 Population Trends

While the U.S. population has grown 13.2 percent over the past 10 years, West Virginia's population has risen 0.8 percent in the last decade to 1,808,344 people. The population of Wayne County has grown an average of 3.0 percent to 42,903 people. In contrast, the population of the town of Wayne has decreased slightly (by 2 percent), declining from 1,128 people in 1990 to 1,105 people in 2000. According to the 2000 Census, both the county and the state population growth remained below the national growth in population of 13.2 percent (U.S. Census Bureau 2007a).

West Virginia had the smallest population increase of any state from the 1990 census to the 2000 census (0.8 percent). Low in-migration may be the result of low economic development in the state, and also due to the rugged terrain and limited access of many areas including, Wayne County (USEPA 2003). Adding to a low growth rate, WVDO (2003) reported four years in a row when more state residents died than were born. Accidents are reported to be a leading cause of death for ages one through 34 years, with motor vehicle accident deaths remaining the principal cause of death (WVDHHR 2000).

Growth is projected to continue slowly, with recent census data indicating that West Virginia and Wayne County are experiencing a slight net in-migration gain. Population projection estimates prepared by the Regional Research Institute at West Virginia University, shown in table 3.8-2, anticipate a slight increase over the next ten to twenty years, barring any significant economic changes (Wayne County 2004). By 2020 the population of Wayne County is expected to increase by 559 people to reach approximately 43,462 people (Wayne County 2004). Statewide growth projections are modest with an approximate increase of 126,000 persons by the Year 2020, with most growth occurring near the populated centers of the state and along the border with Virginia (WVDO 2003).

Table 3.8-2
Population Projections 2000-2020

Region	2000	2005	2010	2015	2020	2000-2020 Population Change	2000-2020 Change (%)
USA	281,421,906	295,507,134	308,935,581	322,365,787	335,804,546	54,382,640	19.3
West Virginia	1,808,344	1,746,336	1,769,081	1,796,311	1,826,389	18,045	1.0
Wayne County	42,903	42,785	42,847	43,082	43,462	559	1.3

Source: West Virginia University Regional Research Institute 2005

However, a study sponsored by the ARC (conducted by the Center for Business and Economic Research at the University of Kentucky) indicated that between 1997 and 2010, population in the Appalachian region would decline. Central Appalachia is expected to experience the highest decline of the three ARC subregions, at a rate of 1.34 percent, compared to a decline of 0.21 percent in northern Appalachia and a decline of 0.12 percent in southern Appalachia (Thompson and others 2001).

3.8.1b3 Age and Gender Distribution

The 2000 Census data indicate that youths and middle-aged people comprise the largest part of Wayne County's population, as shown in table 3.8-3. The median age in the U.S. is 38.1 years. West Virginia's median age of 38.9 years is the highest of any state in the U.S. (WVDO 2003). The median age in Wayne County is slightly lower at 38.4 years (U.S. Census Bureau 2000, Table DP-1). RUPRI (2006) reports that the percent of the population in the 20 to 44 age groups is greater in the metropolitan areas, while the percent of the population age 55 and older is greater in the non-metro areas.

Table 3.8-3
Age Distribution in Wayne County
2000 Census

Younger than 18 years of age	23.4 percent
Between ages of 18 to 24	8.7 percent
Between ages 25 to 44	27.7 percent
Between ages 45 to 64	25.3 percent
65 years of age or older	14.9 percent

Source: U.S. Census Bureau 2000, Table DP-1

The average ratio of men to women in Wayne County is 48.9 to 51.1, similar to the state's ratio of 49.0 to 51.0 (U.S. Census Bureau 2000, Table DP-1).

3.8.1b4 Marital Status

The percentage of the population over age 15 that has never been married is higher in the state (23.1 percent) than in either Wayne County overall (18.5 percent) or in the town of Wayne (14.8 percent).

More than half of the population is married in West Virginia overall (55.8 percent) and in the town of Wayne (55.1 percent), just above the national average of 54.5 percent. Wayne County's proportion of the population that is married is slightly higher (62.1 percent). The percentage of the population that is divorced is higher at the local level (15.9 percent) than at the state and county level (9.8 percent, each) both of which are comparable to the national average of 9.7 percent (2000 Census Table DP-2).

3.8.1b5 Education Levels

While West Virginia's educational attainment is poor, educational indicators have improved from 1990. In 2004, the state ranked 47th and 48th in high school and 9th grade attainment, respectively (WVDO 2003). From 1990-2000, the number of people over the age of 25 in the county with advanced education has increased. However, the 2000 statistics show that the town of Wayne has dramatically lower levels of educational attainment than Wayne County or West Virginia (table 3.8-4). Approximately 82.5 percent the state's population and 70.5 percent of Wayne County's population had at least a high school level education. In contrast, approximately 58.3 percent of the population in the town of Wayne had at least a high school level education. Approximately 17.3 percent of the state's population had obtained a college degree, whereas an estimated 9 percent of the population in the town of Wayne had obtained a college degree.

Table 3.8-4
Education Levels
2000 Census

	West Virginia		Wayne County		Town of Wayne	
Population 25 years and older	70,926		29,223		748	
Percent High School graduate or higher		82.5%		70.5%		58.3%
Less than 9th grade	4,609	6.5%	3,481	11.9%	172	23.0%
9th to 12th grade, no diploma	7,781	11.0%	5,128	17.5%	140	18.7%
High School (or GED)	29,444	41.5%	11,242	38.5%	264	35.3%
Percent Bachelor's degree or higher		17.3%		11.9%		9.0%
Some college, no degree	12,822	18.1%	4,707	16.1%	91	12.2%
Associate degree	3,971	5.6%	1,200	4.1%	14	1.9%
Bachelor's degree	7,611	10.7%	2,100	7.2%	26	3.6%
Graduate or professional degree	4,688	6.6%	1,365	4.7%	41	5.5%

Source: U.S. Census Bureau 2000, Table DP-2

3.8.1b6 Housing

According to the 2000 Census, there were 19,107 households in Wayne County. The average number of persons per household was 2.48, which is slightly higher than the statewide average of 2.4. The town of Wayne has the smallest household number of 2.23. Of these households, the majority are families, with a

small percentage made up of people 65 and over living alone. Household size decreased slightly in the state as well as the county between 1990 and 2000 (U.S. Census 2000, Table DP-1).

The proportion of home ownership in the State of West Virginia is 24.8 percent, compared to the proportion of 78.1 percent in Wayne County. However, proportionally fewer of the state's homeowners are free of a mortgage (47.7 percent) than in Wayne County (50 percent) and the town of Wayne (56.6 percent). State-wide, the average monthly mortgage is more than $700, which is significantly higher than the $200 average for the county and town. Likewise, the state average for monthly rent ($401) is higher than the rent for Wayne County ($382) or the town of Wayne ($366) (U.S. Census 2000, Tables DP-2, DP-4).

3.8.1b7 Commuting Patterns

In the town of Wayne, more people walk to work than in the rest of the county or the state. The town of Wayne has no public transportation. The distance from Huntington to the town of Wayne is 18 miles and takes somewhat more than half an hour to drive; the distance from Huntington to East Lynn is 26 miles and takes closer to an hour to drive. Driving in from Kentucky is not a difficult commute; the drive from Louisa, Kentucky to Wayne, West Virginia is less than 17 miles and takes about half an hour. South Point, Ohio is directly across the Ohio River from Kenova and the commute to Wayne is about 24 miles and takes 40 minutes to drive.

Rockspring employs 393 people at its existing facilities near the proposed lease tracts. About 37 percent of the Rockspring employees live in Wayne County, with more than18 percent living in communities near the proposed lease tracts. Another 37 percent live in adjoining counties in West Virginia (table 3.8-5) and 26 percent live in the adjoining states of Kentucky and Ohio

Argus employs 238 people at its existing facilities near the proposed lease tracts. Almost one-third of the Argus employees live in Wayne County, with over 19 percent living in communities near the proposed lease tracts. Another 51 percent of Argus employees live in adjoining counties in West Virginia. Approximately 16 percent of Argus employees live in the adjoining states of Kentucky, Ohio and Virginia (table 3.8-5).

Table 3.8-5
Applicants' Employees and Their Communities of Residence

LOCATION	ROCKSPRING Number of Employees	ROCKSPRING Percentage of Employees	ARGUS Number of Employees	ARGUS Percentage of Employees
Wayne County				
Communities near the proposed lease tracts				
East Lynn or Wayne (same zip code)	*(East Lynn) 48 (Wayne)14*	*15.8*	*6*	*2.5*
Genoa	*4*	*1.0*	*11*	*4.6*
Dunlow	*7*	*1.8*	*29*	*12.2*
Subtotal, Communities near the proposed lease tracts	*73*	*18.6*	*46*	*19.3*
Other communities within Wayne County	71	18.1	32	13.4
Subtotal, Wayne County	**144**	**36.6**	**78**	**32.8**
Subtotal, Adjacent Counties In West Virginia	**145**	**36.9**	**121**	**50.8**
Other States				
Kentucky	*103*	*26.2*	*37*	*15.5*
Ohio	*1*	*0.3*	*1*	*0.4*
Virginia			*1*	*0.4*
Subtotal, Other States	**104**	**26.5**	**39**	**16.4**
Total	**393**	**100**	**238**	**100**

Source: Barton 2007a, Maggard 2007g

3.8.1c Social and Economic Conditions–Ethnic Diversity

Racial and ethnic data from 2000 for the State of West Virginia and Wayne County are shown in table 3.8-6. The county and the state have predominantly white populations, both with percentages over 95 percent. In 2000, the Latino/Hispanic group formed the dominant ethnic group in Wayne County, comprising 0.5 percent of the population. The Black/African American community was Wayne County's smallest ethnic group, comprising 0.1 percent of the population (U.S. Census Bureau 2000, Table DP-1). At this time, West Virginia has no federally recognized tribes or Native American traditional areas (Anslinger and others 2007).

Table 3.8-6
Race and Ethnicity
West Virginia and Wayne County, 2000

Region	White	Black, African American	Native American, Alaska Native	Asian, Pacific Islander	Some Other Race	Two or More Races	Latino, Hispanic, Any Race
West Virginia	95.0%	3.2%	0.2%	0.5%	0.2%	0.9%	0.3%
Wayne County	98.8%	0.1%	0.2%	0.2%	0.1%	0.6%	0.5%

Source: U.S. Census Bureau 2007a

According to Census 2000, the racial/ethnic makeup of the town of Wayne was very similar to the makeup of the county: 98.0 percent White; 0.5 percent Latino Hispanic (any race); 0.9 percent Native American; 0.5 percent Asian; 0.4 percent from some other race; and 0.1 percent Black/African American (U.S. Census Bureau 2000, Table DP-1). The town of Wayne, according to Census 2000, had a population of 1,105 people, with 486 households and 322 families residing in town.

Nearly a quarter of all residents, the largest percentage, in Wayne County and the town of Wayne report "American" ancestry, most likely indicating that their families have been here for generations. The ethnicities most often reported are English (9.5 percent), Irish (8.1 percent), German (6.4 percent), and Scots-Irish (2.3 percent). Less frequently cited heritage groups for Wayne County are: Dutch, Scottish or Italian (1 percent each); and French (except Basque), European, Welsh, and Polish (less than 1 percent each) (U.S. Census Bureau 2000, Table DP-1).

3.8.1d Social and Economic Conditions–Employment and Unemployment

Employment data used as economic indicators include:

- the number of people employed,
- the number of people unemployed, and
- the overall employment rate.

Table 3.8-7 shows employment data for the State of West Virginia and Wayne County in 1990 and 2000. The state's average unemployment rate was 7.3 percent in 2000. The county's rate was slightly lower, at 6.6 percent, down from a rate of 10.5 percent in 1990 (U.S. Census 2007a).

Table 3.8-7
Employment Data 1990-2000

	Employed Persons		Unemployed Persons		Percent Unemployed	
Region	**1990**	**2000**	**1990**	**2000**	**1990**	**2000**
West Virginia	671,085	732,673	71,142	58,021	9.6%	7.3 %
Wayne County	14,598	16,184	1,703	1,146	10.5%	6.6 %

Source: U.S. Census 2007a

RUPRI (2006) reports that Wayne County is one of 35 West Virginia counties classified as "low-employment" counties. These counties are designated based on the Economic Research Service classification if they have "less than 65 percent of residents 21-64 years old [who] were employed in 2000."

Data collected in 2002 indicate that an estimated 591 businesses exist in Wayne County (Federal Reserve Bank of Richmond 2004). The top ten employers in Wayne County as of March 2006 includes both Rockspring and Argus (Workforce West Virginia 2007):

1. Wayne County Board of Education
2. Veterans Administration Hospital
3. **Rockspring Development, Inc.**
4. Kanawha River Terminals, Inc. (Hatfield Dock and Transfer)
5. Wal-Mart Associates, Inc.
6. Wayne County Community Services Organization, Inc.
7. **Argus Energy WV, LLC**
8. Aristech Chemical Corporation
9. Wayne County Commission
10. American National Rubber Company

3.8.1d1 Employment by Sector

For both Wayne County and the State of West Virginia, the services sector experienced the largest growth between 1990 and 2000, with a 52.5 percent increase in employment in Wayne County (table 3.8-8). The finance/insurance/real estate sector (19.0 percent) and public administration sector (19.0 percent) also experienced high growth (Hammond 2005). Over the same 10-year period, employment in the other industry sectors in Wayne County declined, with decreases in employment as much as 30 percent. Since 1970, a shift away from manufacturing to services has negatively impacted earnings and income in West Virginia (WVDO 2003).

This decline may be attributed to changes in agriculture and fishing practices throughout West Virginia, as timber production and mining have always been important components of the planning area's economy. During the past decade and through the present, the agriculture industry in the planning area has trended toward fewer farms and full-time farmers and a decrease in the average farm size. Much of

the decline can be explained by a decrease in the last decade in the value of livestock, poultry, and related products throughout the nation.

Table 3.8-8
Employment by Sector
West Virginia and Wayne County, 1990 and 2000

Sector	West Virginia	Wayne County	Wayne County Percent Change 1990-2000
Mining*			
1990	36,412	481	
2000	(D)	(D)	**N/A**
Agriculture/Forestry/Fishing/Mining*			
1990	48,916	630	
2000	29,945	443	**-30.0%**
Manufacturing			
1990	99,741	2,561	
2000	87,147	2,174	**-15.1%**
Construction			
1990	46,855	1,149	
2000	51,512	1,022	**-11.1%**
Transportation/Warehousing/Utilities			
1990	53,338	1,679	
2000	43,946	1,541	**-8.2%**
Trade			
1990	145,363	3,209	
2000	116,180	2,839	**-1.5%**
Finance/Insurance/Real Estate			
1990	30,235	553	
2000	33,408	657	**19.0%**
Public Administration			
1990	29,686	574	
2000	42,451	683	**19.0%**
Services			
1990	216,951	4,238	
2000	314,168	6,461	**52.5%**

Notes: * Mining was accounted for as a separate sector in the 1990 census; in the 2000 census mining was accounted for in combination with the agriculture, forestry, and fishing sectors.

(D) indicates less than 10 jobs or undisclosed and confidential information.

N/A indicates unavailable information.

Source: U.S. Census Bureau 2009

RUPRI (2006) reports that the self-employed comprise 20 to 30 percent of non-farm employment in Wayne County. RUPRI uses these statistics as a county level indicator of entrepreneurship, and Wayne County ranks among the top 15 counties in West Virginia.

3.8.1e Social and Economic Conditions–Income and Poverty Levels

Indicators of income that the U.S. Census Bureau calculates include "income in households" and "income of families." Income in households is defined as income generated by all individuals 15 and older, whether related to the head of household or not. Table 3.8-9 shows the median household income, per capita income, and percent of population living in poverty for the State of West Virginia, Wayne County, and the town of Wayne.

Table 3.8-9
Income and Poverty Level
1990 to 2000

Region	Median Household Income		Per Capita Income		Percent of Population Living in Poverty	
	1990	2000	1990	2000	1990	2000
West Virginia	$20,795	$29,696	$10,520	$16,477	19.7%	17.9%
Wayne County	$23,311	$27,352	$9,430	$14,906	21.8%	19.6%
Town of Wayne	$13,844	$20,242	$9,039	$11,626	27.4%	30.3%

Note: All dollar values are given as reported by the U.S. Census, unadjusted for inflation
Sources: U.S. Census Bureau Census 2000, Table DP-3
(U.S. Census Bureau, 2007a, and U.S. Census Bureau 1990a).

3.8.1e1 Wayne County

Wayne County had both a lower per capita income and median household income than the State of West Virginia. Wayne County had a total personal income (TPI) in 2001 of approximately $7.1 million, ranking 18th in the state. Wayne County's TPI accounted for 1.7 percent of the state total. Total personal income includes net earnings by place of residence; dividends, interest, and rent; and transfer payments received by the residents of Wayne County. In 1991, when Wayne County ranked 17th in the state, the TPI was $5.2 million. The 2001 TPI reflected an increase of 2.9 percent from 2000 (Wayne County 2004). In 2001:

- Net earnings accounted for the largest share of income at 60.9 percent of TPI (compared with 65.1 in 1991).
- Dividends, interest and rent were 13.7 percent (steady compared with 14.9 in 1991).
- Transfer payments were 25.4 percent (an increase compared with 20.0 in 1991).

3.8.1e2 Town of Wayne

The 2000 Census shows the median income for a household in the town of Wayne as $20,242 and the median income for a family as $24,750. Males had a median income of $27,292 compared to $23,500 for females. The per capita income for the town was $11,626. About 25.3 percent of families (82 families)

and 30.3 percent of the population (330 individuals) were below the poverty line, including 32.6 percent of those under age 18 and 20.6 percent of those aged 65 or over (U.S. Census Bureau 2000, Table DP-3).

3.8.1e3 Transfer Payments

Wayne County and the town of Wayne are very dependent on transfer payments, both from the government and from settlements or private retirement plans. Wayne County experienced a growth of transfer payments from 1970 to 2005. Total payments increased by 76 percent from $96 million in 1990 to $170 million in 2000, and increased again by another 33 percent to $226.9 million in 2005. The largest payments were for retirement and disability, followed by medical payments. The number of SSI recipients held steady from 1996-2003 in the range of 2,208-2,269 (BEA 2007b).

Both the town and county show very high numbers from the 2000 Census (Table DP-3) that are not in the labor force: for the county more than 49 percent and for the town of Wayne nearly 55 percent. The 2000 Census reports 15,851 workers out of a total population of 42,903 or 37 percent employment for the population over the age of 16 in the county, and 361 workers (U.S. Census Bureau 2000, Table DP-3) or 33 percent employment for the population over the age of 16 in the town of Wayne. Age demographics for both the county and the town (2000 Census Table DP-1) show that about 15-16 percent of both the county and town are likely retired. Within the working age population of 21-64 years, the 2000 Census (Table DP-2) shows residents with a disability at 31.3 percent for the county and at 39.3 percent in town. RUPRI (2006) classifies Wayne County as a "low-employment county" as shown on figure 3.8-4.

3.8.1e4 Poverty Rates

The proportion of the Wayne County population living in poverty was higher than West Virginia's in both 1990 and 2000. The percentage of both the state's and the county's population living in poverty decreased slightly between 1990 and 2000. In 2000 the proportion of the population living in poverty in West Virginia was 17.9 percent. That same year, the proportion of the population living in poverty in Wayne County was 19.6 percent, 2.2 percent lower than in 1990 (U.S. Census Bureau 2000, Table DP-3). In 2004, the proportion of the population living in poverty for the State of West Virginia dropped to 16.2 percent and for Wayne County dropped to 17.4 percent (U.S. Census Bureau 2007b). Figure 3.8-5 shows the percentage of population in poverty for all counties in the State of West Virginia.

Over the past 40 years the ARC has tracked the well-being of the counties within the region. West Virginia, along with eastern Kentucky, has maintained the highest concentration of economically distressed counties (ARC 2007). According to WVDO (2003) every county in West Virginia has a per capita income below the U.S. average. RUPRI (2006) indicates that per capita income in Wayne County in 2004 was in the range of $20,000 to $24,999.

3.8.1f Social and Economic Conditions–Natural Resources

Historically, the local economy has relied heavily on its natural resources: bituminous coal, and oil and natural gas. In addition, agricultural income is generated from livestock, fruit, and tobacco farms (West Virginia Association of Counties 2006).

3.8.1f1 Coal–Overview of Coal Economics

The economic role of coal mining can be measured by the percentage of total employment and earnings directly attributed to coal mining. In addition to coal mining wages, federal royalties and fees, along with state severance taxes also dramatically add to the state and local economy.

In 2001, the University of Kentucky Center for Business and Economic Research (UKYCBER) completed a *Study on the Current Economic Impacts of the Appalachian Coal Industry and Its Future in the Region*. Thompson and others (2001) divided the 118-county Appalachian region studied into three regions: northern, central, and southern Appalachia. Central Appalachia included the border counties where Kentucky, West Virginia, and Virginia meet–including Wayne County. Within the Appalachian region as a whole, coal mining employment is concentrated in central Appalachia. Figure 3.8-6 shows total coal production (1997) by county in the Central Region as reported in the UKYCBER study (Thompson and others 2001).

While coal mining is declining from a once dominant role in the West Virginia economy, it continues to contribute significantly, accounting for over three percent of that state's total employment and over five percent of total earnings (USEPA 2003). Some West Virginia counties are still dependent on coal extraction as an economic driver. In the study prepared for the *Mountaintop Mining/Valley Fill EIS* (USEPA 2003), mining made up more than ten percent of employment and personal earnings in a number of the West Virginia study area counties in 1998. For Wayne County, mining jobs accounted for 16 percent of the employment in 1998, and 8.6 percent of total earnings.

While mining jobs are becoming more skilled and less plentiful, wages are higher than in the past. A study at Marshall University's Center for Business and Economic Research showed that coal production in nine counties in southern West Virginia increased by 40 percent over the period 1980-1998 even as underground mining employment declined by 70 percent and surface mining employment declined by 50 percent. During the same period however, average underground mining productivity in West Virginia quadrupled from 2,100 tons per employee in 1980 to 8,000 tons per employee in 1998 (Burton, Hicks and Kent 2001).

Marshall University's study area, which did not include Wayne County, lost half of its mining jobs in the period from 1980 to 1990. The rate of loss slowed for the period 1990-1997, and has stabilized to be less now than the state overall. Some dramatic statistics were cited in the *Mountaintop Mining/Valley Fill EIS* (USEPA 2003): in 1980, six of the West Virginia study area counties had more than 4,000 mining employees; but by 1997 none of the counties had 4,000 or more mining employees.

3.8.1f2 Multiplier Effects

The economic impact of mining extends beyond the county where a mine is located. When one economic activity in a community results in induced or indirect socioeconomic benefits in that community or in a wider region, this effect is referred to as the multiplier effect. For example, a business owner may start a company or expand an existing business and earn increased revenue, directly benefiting from the activity. If that business owner increased wages of his existing employees or hired additional staff as a result of the start-up or expansion, then those employees' earning and spending power is affected, altering supply and demand patterns within a community, and engendering and promoting employment. Additional revenues and monies within a community also increase its ability to further promote greater local economic and

social activity, such as developing new infrastructure and improving or expanding recreational facilities and opportunities.

With regard to the coal mining industry, coal miners commonly commute long distances to jobs. Thus, while the published employment numbers indicate where the wages are earned, the numbers do not reflect where the wages are spent. In addition, the businesses that provide inputs to the local coal industry can be located in other counties or states (USEPA 2003). When the multiplier effect of mining jobs is considered, the influence is much greater than first expected.

At the state level, the WVDO prepared an economic impact study of the coal mining industry in West Virginia for 2006. The WVDO calculated direct, indirect and induced effects of the mining industry (Peterson 2007). Direct effects are those generated by the industry itself; indirect effects account for the impact of the industry and its employees spending money in the state; and induced effects represent the impacts of new household income created by direct and indirect spending. Results of WVDO's IMPLAN economic impact model are shown in table 3.8-10.

Table 3.8-10
Economic Impact of the Coal Mining Industry
in West Virginia, 2006

Effect	Employment	Labor Income ($)	Industrial Output ($)	State and Local Taxes ($)
Direct	18,365	1,635,693,000	6,502,714,000	624,474,000
Indirect	10,352	543,381,000	2,169,257, 000	117,506,000
Induced	15,578	441,093,000	149,242,300	89,371,000
TOTAL EFFECTS	**44,295**	**$2,620,167,000**	**$8,821,213,300**	**$831,351,000**

Source: WVDO 2007

In the analysis of these data, WVDO developed the following multipliers (WVDO 2007):

- **For every one job in the state's coal mining industry in 2006**, an additional 1.4 jobs were created elsewhere in the state's economy. While the mining industry directly supplies only 18,365 jobs, the multiplier effects indicate that the industry is responsible for a total of 44,295 jobs including those created elsewhere in the economy.
- **For every $1 in wages and benefits paid by the coal mining industry, an additional 60 cents in wages and benefits were paid elsewhere in the state's economy.** While the direct industry wages are less than $1.7 billion, the multiplier effects indicate that the industry is responsible for a total of more than $2.6 billion in wages.
- **For every $1 in industrial output from the coal mining industry, an additional 36 cents in industrial output was created elsewhere in the state's economy.** While the mining industry is directly responsible for $6.5 billion in output, the multiplier effects indicate that the industry is responsible for more than $8.8 billion in total industrial output.
- **For every $1 in state and local taxes paid by the coal mining industry, an additional 33 cents in taxes were paid by spin-off businesses and their employees.** While the industry pays nearly $624.5 million in taxes, total tax revenue generated is more than $830 million.

3.8.1f3 Economic Sectors–Coal

Economic Sectors–Coal–West Virginia–West Virginia has an estimated coal reserve of 33.7 billion tons, of which an estimated 18.4 billion tons is recoverable (OSM 2004). . The state is the second largest coal-producing state and a leading exporter. Approximately 92,940,000 short tons of coal were mined in southern West Virginia in 2004 (EIA 2007a). In 2005, 270 coal companies operated 574 mines in West Virginia, including 329 underground mines and 245 surface mines. The same 270 coal companies operated roughly 600 mines in 2006, including 330 underground mines and 271 surface mines–a 4 percent increase in the total number of mines (WVCA 2007a). Approximately 91 percent of the coal produced in West Virginia is transported–mainly by rail, but also by truck or barge–to regional and national destinations (EIA 2007a) to generate electricity for domestic use (OSM 2004).

The coal mining industry contributes beneficially to the state, county, and local economies in several ways. The West Virginia Office of Miners' Health, Safety and Training (WVMHST) coal production and employment show that coal mining employment in the state reached a high of 130,457 in 1940. Since that time employment numbers have slowly declined, reaching a low of 14,281 in 2000. Since 2000, the number of people employed in coal mines in the state has been increasing. Approximately 42,744 people were employed in the coal mines of West Virginia in 2006 (WVMHST in WVCA 2007a). The West Virginia coal industry pays nearly one billion dollars in annual direct wages. Coal mining accounts for $3.5 billion (13 percent) of West Virginia's total gross state product. In addition, the coal industry and coal-fired electricity industry account for 60 percent of all business taxes collected in West Virginia (WVCA 2007a).

West Virginia coal miners are among the highest paid workers in the state, earning an average annual salary of over $50,000, nearly twice the average statewide salary for all workers (WVCA 2007a). Studies conducted by Marshall University independently of the work done by the WVDO have concluded that every coal mining job results in the creation of between six to eight positions in other sectors of the economy, and that every dollar's worth of coal production supports an additional 52 cents in sales in other sectors of the state economy (Burton, Hicks and Kent 2001; USEPA 2003).

Economic Sectors–Coal–Wayne County– Small-scale coal mining is common throughout Wayne County. Since the 1800s, residents have dug "house" mines by hand to obtain coal to heat their homes. Coal companies have operated mines in the area for more than a century. In 2006 a total of six underground and surface mines, produced a total of 4.8 million short tons of coal from those mines (WVCA 2007a). Wayne County's underground mines rank 9th out of the 27 coal-producing counties in the state (WVCA 2007a). Approximately 3,672,220 tons of coal were produced, primarily by Rockspring and Argus (WVMHST in WVCA 2007a). Rockspring's Camp Creek No. 1 Mine, located north of the proposed lease tracts, ranked sixth in the top 18 "million-ton" underground mines in 2006, producing 2,735,790 tons.

According to West Virginia's Office of Miner's Health Safety and Training (WVMHST), 456 coal miners were employed in Wayne County in 2006. Those coal miners as a group earned a total direct wage of $28,591,200 in 2006 (WVCA 2007a).

Economic Sectors–Coal–Applicants' Economic Impact–In the vicinity of the proposed lease tracts, Rockspring, a subsidiary of Riverton Coal, has operated underground mines since 1978. Argus, and its

predecessor Pen Coal Corporation, have operated surface and underground mines in the area since 1987. Other companies have also operated mines in the area.

Currently, the Applicants operate underground room-and-pillar mines under private lands that adjoin the proposed lease tracts. In 2006, Rockspring generated approximately $15 million in taxes for the county and state (Barton 2007a), and Argus generated approximately $8.9 million (May and Hall 2007). Payroll, revenue, and taxes generated by the two companies are show in table 3.8-11.

Table 3.8-11
Applicants' 2006 Economic Information

	Rockspring	Argus	Combined
Average Annual Salary			
with overtime	$71,407	$51,977	
without overtime	$54,018	$39,415	
Payroll	$23,400,000 ($900,000 every two weeks)	$12,370,693 annually	$35,770,693
Gross Revenue (annual, approximate)	$120,000,000	$93,508,569	$213,508,569
Taxes Generated county/state (annual, approximate)	$15,000,000	$8,905,532	$23,905,532

Source: Barton 2007a; Maggard 2007a, h

The Applicants invest large amounts of money in the local and regional economy by paying employees' wages, paying taxes, buying supplies and equipment, and purchasing and maintaining equipment. When added together, the two companies employ a 500- to 600-person work force of direct employees and contractors. While Rockspring loads its coal into railcars at its Camp Creek preparation plant, Argus contracts local trucking companies to transport its coal from its Devilstrace preparation plant east of Dunlow to its loading facility on the Big Sandy River, 60 miles to the west. In addition to paying approximately $12.4 million in salaries and wages and roughly $8.9 million in taxes in 2006, Argus spent over $23 million on vendors and contractors based in Wayne County and an additional $27 million in other counties in West Virginia, for a total of over $50 million spent on vendors and contractors and an overall total of $71.3 million on salaries and wages, taxes, vendors and contractors in 2006 (Maggard 2007h).

The community also benefits from mining company philanthropy. The two Applicants contribute funds to local communities by:

- supporting local schools
- providing summer jobs to students over 18 years old
- contributing to the construction of baseball fields
- sponsoring fishing outings for grade school children, and
- sponsoring local community events and facilities.

At Rockspring's current production rate of 2.2 million to 3 million tons per year, and at Argus's current production rate of about 2 million tons per year, the Applicants' reserves in the immediate vicinity of the proposed lease tracts would be exhausted in 10 to 15 years. The companies could extend the lives of their operations by decreasing production rates, and they may be able to secure additional reserves in the region that they mine and then haul to their existing preparation plants for processing.

Economic Sectors–Coal–Federal Coal under USACE East Lynn Lake Project Lands–Southwestern West Virginia's Allegheny and Kanawha Formations contain bituminous coal. Both formations are found in the vicinity of the USACE East Lynn Lake Project and include several coal seams. Two seams are considered to be commercially mineable: the No. 5 Block, and the Coalburg/Winifrede seam.

In 1973 Columbia Gas Transmission Corporation conducted a study in the vicinity of the USACE East Lynn Lake Project to determine the quantity and value of coal land that would be adversely affected by the siting of the USACE East Lynn Reservoir. John T. Boyd Company prepared the report, entitled *Coal Land Values, East Lynn Reservoir Area for Columbia Gas Transmission Corporation* (John T. Boyd Co. 1973) and referred to as the "Condemnation Report." The area to be affected is referred to in the Condemnation Report as the "acquisition area."

The acquisition area contained approximately 25,000 acres. Columbia Gas Transmission Corporation's coal lands comprised approximately 16,700 of those 25,000 acres. The boundary of the 1973 acquisition area varies slightly from the current USACE East Lynn Lake Project boundary, and the areas identified within the acquisition area vary somewhat from the current proposed lease tract boundaries. Information in the Condemnation Report indicates that in 1973 approximately 90 million tons of recoverable coal existed under roughly 23,000 acres within the current USACE East Lynn Lake Project boundary (John T. Boyd Co. 1973). To date, no federal coal that lies under the USACE East Lynn Lake Project has been mined.

As noted in section 3.1.1b1, within the 1973 acquisition area, the Winifrede, No. 5, and Stockton-Lewiston coal seams were considered economically mineable, while numerous other seams were found to be too thin to be of mineable thickness (John T. Boyd Co. 1973). The Winifrede (Coalburg) reserves typically are low in sulfur, high in British thermal units (BTU), and used principally for clean electric generation (BLM 2009). As part of the condemnation activities associated with the USACE East Lynn Lake Project, coal interests were to be subordinated to the reservoir interests in certain areas. As a result, mining of the No. 5 Block and Stockton-Lewiston seams, which outcrop extensively and would normally be developed by strip or punch mining, were to be prohibited from extraction (John T. Boyd Co. 1973).

Based on the most recent available data summarized in the RFDS (BLM 2009; presented in appendix B), approximately 41 million tons of Winifrede seam coal lie below the proposed Rockspring lease tracts, and about 11 million tons of that coal is considered to be mineable or "recoverable." Approximately 35 million tons of Coalburg-seam coal lie below the proposed Argus lease tracts, and about 15 million tons of that coal is considered to be recoverable coal. The two companies would use underground room-and-pillar mining methods with 50 percent extraction.

Economic Sectors–Coal–Economic Value of the Proposed East Lynn Lake Coal Lease–A coal company receives payment for the coal it produces and sells. That same coal company also pays a royalty

fee on federal coal, along with several other federal fees or taxes, both federal and state income taxes, a state mineral severance tax, a state excise tax, and county property taxes.

If the Proposed Action is selected and the RFDS is implemented, the successful bidder(s) would earn estimated gross revenues of up to $1,129,862,582 over a period of 10 to 15 years, based on a coal price of $43/ton. If the Applicants are the successful bidders, Rockspring would earn up to approximately $484,862,582 in gross revenue, and Argus would earn up to approximately $645,000,000 in gross revenue.

Economic Sectors–Coal–Federal Royalties, Fees, and Taxes–The BLM manages public lands and the natural resources and the uses that occur on those lands. With regard to natural resources, the BLM manages federal leasable minerals and geothermal resources under authority of the *Mineral Leasing Act* (MLA) *of 1920* (20 USC 181, et seq.), as amended by the *Federal Coal Leasing Amendments Act of 1976*; the *Mineral Leasing Act for Acquired Lands of 1947* (30 USC 351-359); Section 402 of Reorganization Plan No. 3 of 1946 (5 USC Appendix); and various other Acts. The MLA provides for the leasing of federal coal in tracts that allow the mining of all economically extractable coal.

In accordance with the MLA, the Minerals Management Service (MMS) collects royalties and fees on federal coal. States whose boundaries encompass federal mineral leases are entitled to receive a portion of the revenues generated from those leases, based on the revenue earned on the sale of the coal (MMS 2004). The applicable regulations (43 CFR 3483) state that the customary royalty rate is 8 percent for federal coal mined using underground methods. A portion of the revenues is retained by the federal government and is distributed to the U.S. Treasury general fund, where it is appropriated by Congress, and typically to three special funds–the Reclamation Fund, the Land and Water Conservation Fund, and the National Historic Preservation Fund (Etchart 2007). The remainder is distributed to the state government where the coal was mined.

After the BLM awards a lease for federal coal, the successful bidder(s) can apply for a royalty rate reduction by stating reasons and providing supporting information, such as proof of economic hardship. For example, if the customary 8 percent royalty is above the going rate in the private sector, that percentage would be considered unfair to the successful bidder(s). The federal government representative may or may not grant the reduction (Grange 2007).

For federal coal owned by the USACE, such as the federal coal surrounding the USACE's East Lynn Lake Project, 25 percent of the royalties and other revenuesis retained by the federal government and 75 percent is paid to the affected state government, in accordance with the *Flood Control Act of 1946* set forth in the U.S. Code--Title 33 Navigation and Navigable Waters, Chapter 15, Flood Control Section 701C-3 (33 USC Sec. 701c-3).

If the Proposed Action is selected and the RFDS is implemented, current estimates indicate that a maximum of approximately 26,276,000 tons of federal coal could be recovered. If the 8 percent royalty is applied, at a price of about $43 per ton (price of coal at time of lease application submittal), the MMS would collect up to approximately $90,400,000 in royalties over a 10- to 15-year period (table 3.8-12). During that period, the federal government would retain approximately 25 percent of the royalties, up to roughly $22,600,000 (table 3.8-12). The remaining 75 percent, up to approximately $67,800,000 (table 3.8-12), would be allocated to the State of West Virginia.

Table 3.8-12
Estimated Federal Royalty Retained
If the Proposed Action (Preferred Alternative) is Selected

Proposed Lease Tract	Clean Recoverable Tons	Successful Bidder(s) Gross Revenue at $43/ton	Federal Royalty on Federal Coal From Underground Mines (8 Percent)	Revenue Retained By Federal Government (25% of federal 8% royalty)	Revenue Returned to West Virginia (75% of federal 8% royalty)
Rockspring					
Tracts A through F	11,275,874	$484,862,582	$38,789,007	$9,697,252	$29,091,754
Argus					
Tracts A through C	15,000,000	$645,000,000	$51,600,000	$12,900,000	$38,700,000
Total	***26,275,874***	***$1,129,862,582***	***$90,389,007***	***$22,597,252***	***$67,791,754***

Note: Number of tons is approximate and based on information provided in the Applicants' lease applications, as summarized in the Reasonably Foreseeable Development Scenario (BLM 2009)

Black Lung Tax–The federal Black Lung Tax is collected on coal sales: $1/ton for surface mines and $3/ton for underground mines. If the proposed mining is implemented, over a 10- to 15-year period the successful bidder(s) would pay up to approximately $78,827,622 in Black Lung taxes.

Special Reclamation Fund Fees–Levied under SMCRA Section 402, the Special Reclamation Fund supports abandoned mine land reclamation projects and the United Mine Workers Combined Benefit Fund. Surface mined coal is levied a fee at a rate of 35 cents per ton; underground mined coal is levied a fee at a rate of 15 cents per ton. Half of these revenues are supposed to be returned to the state in which the coal was produced, to be used in funding reclamation or acid mine drainage abatement projects at abandoned mines. A significant amount of money flows to the study area states from the fund. In fiscal year 1999, more than $47 million went to AML programs in the states in Appalachia; West Virginia's portion was $20.2 million (OSM 1999). If the proposed mining is implemented, over a 10- to 15-year period the successful bidder(s) would also pay up to approximately $3,941,381 in Special Reclamation Fund fees, with approximately one-half of that amount (as much as approximately $1,970,690) returning to the State of West Virginia.

Economic Sectors–Coal–State Fees and Taxes–Coal mining in West Virginia also contributes to public finance through other taxes, including various severance, property, and income taxes. The major categories of revenue for the West Virginia state government include the General Revenue Fund, the State Road Fund, lottery funds, federal funds and special revenue funds. The General Revenue Fund includes funds from income tax, sales tax, business and occupation taxes and the Natural Resource Severance Tax.

Severance Taxes– Eighty-five to ninety percent of severance tax revenues in West Virginia come from coal production, and the remaining portion comes from oil and natural gas production. West Virginia's coal severance tax is levied as a five percent tax on gross receipts on the sale of the privately owned product severed (West Virginia State Tax Department, 2005).

The WVCA describes the state's coal severance tax (WVCA 2007a):

- In 1987, West Virginia enacted a severance tax on coal. The tax amounts to 5 percent of the sale price of mined coal. Of this amount, the state retains 93 percent. The remaining 7 percent is apportioned among the state's 55 counties and its 230 incorporated municipalities.
- Three-fourths of the 7 percent share is divided among the coal producing counties. This money is apportioned according to each county's coal production.
- The remaining one-fourth of the 7 percent is divided among all counties and municipalities, according to population.
- All incorporated communities receive a share, based on population.
- All counties receive an additional share, based on the population of the unincorporated areas of the county.

West Virginia produced approximately 158,835,584 tons of coal in 2006. The total severance tax collections on private coal in West Virginia for 2006 amounted to about $386,000,000. Approximately $25,438,861 was distributed to all counties and municipalities in West Virginia. Of this amount, about $18,992,932 represented coal production in the 27 coal producing counties (West Virginia State Treasurer's Office in WVCA 2007a). Table 3.8-13 summarizes the distribution of state coal severance taxes in 2003, 2005, and 2006.

Wayne County produced a total of about 4.8 million short tons of coal in 2006 (WVCA 2007a). As shown in table 3.8-13, Wayne County received approximately $388,359 in coal severance tax revenue in 2006, or about 1.5 percent of the total amount allotted to counties and municipalities. Of that amount, the county received approximately $110,955 in coal severance tax for its unincorporated lands, and $252,600 for its coal production (WVCA 2007a). That same year, the municipalities within Wayne County received approximately $24,801(table 3.8-13), with the town of Wayne receiving approximately $3,869 of that total.

Rockspring produces between 2.2 million and 3 million tons of coal per year, and Argus produces about 2 million tons per year. As the largest coal producers in the county, and therefore the largest contributors to state severance tax revenues, the Applicants' presence in the vicinity of the proposed lease area and their economic contributions to the area are integral to the local economy.

If the Proposed Action is selected and the RFDS is implemented, the State of West Virginia would receive up to an estimated $52,538,610 (table 3.8-14) in severance tax revenue, and the counties and incorporated municipalities would receive up to an estimated $3,954,519 (table 3.8-14) in severance tax revenue over a period of 10 to 15 years. Wayne County would receive up to an estimated $60,504 over that same period.

Table 3.8-14
Potential Estimated State Severance Tax Revenue to Wayne County and Its Municipalities Over a Period of 10 to 15 Years If the Proposed Action (Preferred Alternative) is Selected[1]

Maximum Amount of Clean Recoverable (tons)[2]	26,275,874
Successful Bidder(s) Potential Revenue at $43/ton	$1,129,862,582
Potential 5 Percent State Severance Tax on East Lynn Lake Federal Coal	$56,493,129
Potential Revenue Retained By State Government (93% of federal 5% tax)	$52,538,610
Potential Revenue Returned To 55 counties and 230 incorporated municipalities (7% of 5% tax)	$3,954,519
Potential Revenue Returned To 27 Coal-Producing Counties (75% of 7%)	$2,965,889
Potential Revenue Returned To All Counties and Municipalities, According to Population (25% of 7%)	$988,630
Potential Revenue Returned to Unincorporated Portions of Wayne County Based On Its Population	$17,286
Potential Revenue Returned to Wayne County Based On Its Coal Production	$39,352
Potential Revenue Returned To Wayne County Municipalities, According to Population	$3,866
Total, Potential Revenue Returned To Wayne County	***$60,504***

Notes: Percentages and revenues calculated based on values presented for Wayne County in *Coal Facts 2007* (WVCA 2007a)
[1]Based on Estimated Tons Recoverable, $43/ton Coal Price, and 2006 State Severance Tax Receipts
[2] Presented in Reasonably Foreseeable Development Scenario (BLM 2009)

Property Taxes–Property taxes related to active coal mines contributed approximately $43 million statewide in the 2002-2003 fiscal year. An excise tax of $0.56/ton on the assessed value of coal reserves is collected for use in debt reduction. In the 2002-2003 fiscal year, this tax contributed another $14 million. Combined, these property taxes accounted for approximately 34 percent of all property taxes collected statewide. Property taxes are a major income source for county governments and school districts in West Virginia. Approximately 68 percent of property tax revenues are allocated to schools and these revenues account for roughly 30 percent of the typical school district budget (USEPA 2003).

However, the amount of property taxes that the successful bidder(s) would be required to pay is not clear. A lessee does not pay property taxes if the mineral rights owner is not required to pay these taxes. The case of the proposed East Lynn Lake coal lease is unusual in West Virginia because the mineral rights owner is the federal government, who does not pay property taxes. Consequently, research to date indicates that the successful bidder(s) would not be required to pay property taxes (Mairs 2007).

Other State Taxes and Fees–Other state taxes– and fees may be collected, including:

- *Special Reclamation Fund Fee*–The state government also collects a 7-cent-per-ton of clean-coal Special Reclamation Fund Fee. If the proposed mining is implemented, the successful bidder(s) would pay as much as approximately $1,839,311 in state reclamation taxes.
- *Services fees*–collected at 2 cents per ton.
- *Highway transportation fees*–WVDOT collects 5 cents per ton.
- *Workers' Compensation tax*–collected at 56 cent per ton.

Economic Sectors–Coal–Market Conditions–Market conditions that influence coal economics–price and demand–include global competition, regulations in the power industry, and political and safety concerns.

Global competition–Competition from other countries has reduced the demand for U.S. coal. However, it is expected that the demand for domestic energy sources such as coal will increase in response to higher oil prices. If the current trend continues, domestic and possibly foreign demand for the coal remaining in the Appalachian region likely will increase in the coming years.

Chemical properties of coal–Air-borne sulfur compounds that contribute to acid rain are regulated under Title IV of the *Clean Air Act* (42 USC 7651). As a result, power plant operators are purchasing coal that is lower in sulfur, and coal containing higher sulfur concentrations is becoming less and less valuable in the U.S. and other countries. The remaining coal reserves in West Virginia are higher in sulfur compounds than the coal available from other U.S. sources, primarily from the Powder River Basin. Additional emissions regulations may be implemented in the future that would further reduce the value of higher-sulfur content coal typically found in the Appalachian region.

Impacts to water quality and other environmental issues–Whether perceived or real, water quality and other environmental issues associated with surface mining activities raise concerns with non-governmental organizations (NGOs). In particular, NGOs are opposed to surface mining that involves removal of large amounts of overburden to access coal seams, known as "mountaintop mining." The NGOs are requesting that federal and state agencies implement more stringent environmental regulations. If these regulations are enforced, coal companies would face cost increases related to mining the coal and disposing of overburden.

Safety requirements–also impact coal economics. Since the recent underground coal mine incidents in West Virginia and Utah, federal and state agencies have been examining current underground mining methods and are proposing additional safety regulations in an effort to address such accidents and avoid similar accidents. As a result, coal companies are facing increased costs to implement safety programs and install safety measures.

3.8.1f4 Economic Sectors–Oil and Natural Gas

In addition to the federally-owned coal, privately-owned oil and natural gas is present under the proposed lease tracts. Estimates of oil and gas reserves in southwestern West Virginia vary widely, and production can range from as low as 10 to 100 million barrels of oil equivalent (MBOE) to as high as 1,000 to 10,000 MBOE, according to EIA data (EIA 2007b). In 2005, 230 billion cubic feet (Bcf) of dry natural gas were extracted from West Virginia (EIA 2006). At least 144 oil and gas wells exist on the proposed lease tracts (BLM 2009). West Virginia Geological and Economic Survey data collected in 2001 indicate that 2,501 to 6,000 million cubic feet (mmcf) of natural gas were produced in Wayne County (WVGES 2003).

Eleven new natural gas fields were discovered in West Virginia in 2005. The proved dry natural gas reserves in West Virginia increased by 1,062 Bcf between the years 2004 to 2005, from 3,397 Bcf to 4,459 Bcf. This increase, along with the discovery of 11 new fields, suggests an increased level of exploration in the area and an increased level of extraction in the coming years (EIA 2006).

Coal bed methane forms within coal seams. A regional estimation of proved coal bed methane reserves indicated that several ranges may apply to the vicinity of the proposed lease tracts: A low estimate of 1 to

200 Bcf, to a high of 500 to 1,500 Bcf (Limerick 2004). In the vicinity of the proposed lease tracts, recovery of coal bed methane has a low to medium likelihood (Limerick 2004).

3.8.1f5 Economic Sectors–Timber

With 12 million acres of forested land representing 78 percent of the state's land, West Virginia is the third most forested state in the U.S., following Maine and New Hampshire. Almost all of the forestland is available for commercial timber production. Historically, logging has been an important sector of the regional, state, and local economy. While employment fell in the state logging industry from 1980 to 2004, trends suggest continued growth. Forest products contribute less than 2 percent of the state GDP, but the wood products industry in total exceeds $4 billion annually (Childs 2005). Private logging operations occur on private and state lands in the vicinity of the proposed lease tracts. Small-scale illegal logging on the proposed lease tracts is expected to remain stable and infrequent.

3.8.1f6 Economic Sectors–Flood Control and Recreation

One of the economic values provided by the USACE East Lynn Lake Project is flood control. The dam provides protection to East Lynn and other downstream communities. Each year, the dollar value of potential flood damages is calculated. Cumulatively through fiscal year 2006, based on best available data, approximately $83,649,000 in potential flood damages was prevented by the facility (McKinley 2006). In addition to the financial value of flood damages prevented, the lake provides recreational opportunities, scenic value, fish and wildlife habitat, and other intrinsic values.

3.8.1g Economic Projections

A study sponsored by the ARC (and conducted by the Center for Business and Economic Research at the University of Kentucky), indicated that between 1997 and 2010, employment would decline by 6.5 percent, regional earnings would decline by 6.1 percent, and that tax revenue would drop by 20.4 percent in central Appalachia. Meanwhile, transfer payments in the area would increase by 5 to 15 percent (Thompson and others 2001).

A more recent forecast prepared by the Bureau of Business and Economic Research (BBER) at West Virginia University calls for West Virginians to be better off (in terms of real per capita personal income) in 2010 than they are now. The forecast also suggests that state growth will fall short of that expected for the nation. This slowed relative growth will result in a widening per capita personal income gap with the nation in coming years (Hammond 2005). Table 3.8-15 shows the actual and anticipated growth in West Virginia and compares the rate of growth to the U.S.

Table 3.8-15
West Virginia and U.S.
Economic Growth and Projections

	West Virginia				Avg. Annual Growth 2005-2010 (%)	
	Actual		Forecast			
	1990	2004	2005	2010	W.V.	U.S.
Population (000s)	1,812	1,815	1,816	1,808	-0.1	0.9
Real Per Capita Income	$21,301	$23,723	$24,488	$27,815	2.6	2.7
Non-farm Jobs (000s)	726.0	736.2	743.9	770.1	0.7	1.1
Unemployment Rate[1] (Percent)	6.3	5.3	4.8	4.6	-0.0	-0.0

Notes: [1]Growth rate is average annual change
All dollar values are given as reported by the U.S. Census, unadjusted for inflation
Source: Hammond 2005

The *West Virginia Economic Outlook 2006* (Hammond 2005) provides a five-year forecast, with the following observations for the state:

- **West Virginia's demographics are in transition**, with an aging population.
- **For the period 2000-2005, West Virginia remained the only state with negative natural increase** (more deaths than births), but gained a total of 7,900 residents, due to domestic migration.
- **West Virginia suffered significant numbers of job losses** during the first three years of the decade, primarily in producing goods. Job growth experienced since 2004 is expected to continue.
- **The Outlook forecasts state job growth of 0.7 percent per year through 2010, adding 5,200 jobs per year.** While 75 percent of the state job gains are expected in the service-providing sectors (professional and business services; health care and social assistance; and leisure and hospitality), natural resources and mining, construction, and manufacturing are also expected to add jobs.
- **For the period 2000-2003, West Virginia experienced strong growth in natural resources and mining** (due to high coal and natural gas prices). Natural resources and mining growth are expected due to an increase in the production of coal and natural gas.
- **Coal production is forecast to rise from 154 million tons in 2005 to 163 million tons through 2008, but expected to "drift downward"** toward the end of the decade. Rising emission restrictions and increased production from western states coal, which competes with lower-sulfur coals produced in the southern part of the state, will dampen demand.
- **Risks to the state forecast include:** a national economic downturn, high energy prices and rising interest rates, and a decline in federal fiscal stimulus. Additional concerns: competitive pressures from Pennsylvania and Maryland in the leisure and hospitality sector; avian flu outbreak in the poultry processing and agricultural sectors; and potential plant closures in the primary metals and chemicals sector.

For more specific regional and mining data, the West Virginia Senate Finance Committee commissioned a study of a nine-county area in southern West Virginia by Marshall University's Center for Business and Economic Research in 2000 (Burton, Hicks and Kent 2001). The baseline forecast projects a one percent decline (1,646) in total private sector employment, assuming that coal production declines by seven percent. Coal mining losses would be responsible for lost jobs and earnings subtracted from these economies. Even as other economic forces are projected to bring new jobs, the direct and multiplier losses reported in these studies indicate the extent to which the mining losses place a drag on local economies (USEPA 2003).

While the forecast for southern West Virginia may be fragile, some economic impetus is expected due to infrastructure improvements planned by the state under the *State Appalachian Development Plan*, prepared by the WVDO (2005).

3.8.1h Social and Economic Conditions–Social Values

3.8.1h1 Appalachian Values

As the most populous and most adapted to the region, the Scots-Irish settlers strongly influenced the evolution of Appalachian identity. Attributes of the Scots-Irish that are frequently recognized are: independence, resourcefulness, faith, family and tradition. Family, work, and community are all integral values of planning-area residents, and environmental protection and diversity, outdoor activity and recreation are especially highly valued. In general, most lifestyles of the planning-area residents are associated with place and community, as well as with natural-resource development, such as mining, logging, and mill work. These attributes contributed to the nature of the Appalachian culture and have shaped the manner in which company-town residents react to the loss of jobs and community (USEPA 2003).

Independence and Isolation–An independent nature serves a particularly useful function where a society is isolated. However, once industrialization is introduced, independence can make the transition more difficult, especially from coal mining jobs to a diverse, less-skilled job market (USEPA 2003).

Resourcefulness–Resourcefulness is closely identified with the Appalachian spirit. Resourcefulness is also expressed in the ability to husband a rugged and inhospitable land. Settlers found sustenance in the woods and in the small gardens that were part of every homestead. The steep valleys did not allow for large agriculture to develop (USEPA 2003).

Faith–Faith forms the core element of the values held in Appalachia, but isolation and independence have fostered a unique religious environment. Appalachia may be one of the most religiously diverse regions in America, where there are 70 or 80 subsets of Baptist congregations, not just the “Old Time” and “Progressives.” Anslinger and others (2007) report that the first Baptist Church in Wayne County was established in 1812. The Rev. Peyton Newman formed the Big Sandy Baptist Church in the Butler District. The first church in Twelvepole Creek was established by Primitive Baptist minister Rev. Goodwin Lycan, followed by the Bethesda Baptist Church in 1835. The Baptist tradition flourished in Appalachia and is considered an integral part of modern Appalachian life (Drake 2001).

The diversity of religious affiliation is found in the numerous denominations located in Wayne County. *The Wayne County News* (2007) provided a directory in the November 3 edition that lists 63

congregations, including 32 Baptists, 8 Methodist, 7 Pentecostal/Adventists, 1 Presbyterian, 1 Catholic, and 14 non-denominational.

Attachment to Family and Land–Dependence on the land and making a living from local resources emphasize the importance of the family unit and also of the resources themselves. The independence of the culture and the abundance of wildlife and other resources naturally forge a bond to the land. This attribute makes sense so long as sustenance is derived from the land.

When hard times came, out-migration resulted from the mine closures. However, as families leave, it is expected that at some point they will return to Appalachia. The migration is often thought to be temporary. While the attachment to the land and family is a strong tie, the typical boom-and-bust cycle of mining work reinforces the idea that migrants will return. In the past, when a mine shut down, there was a period after which residents expected it to re-open. Many still believe the mines will re-open despite repeated warnings from the mining companies (USEPA 2003).

Later, in the 1970s, when some residents were forced to vacate their land for the USACE East Lynn Lake Project, attachment to the land made the transition difficult. The stories of the families in and from the area carry forward the idea that a "sense of place" is very strong in this community. In the introduction to *The Appalachians: America's Last Frontier,* Mari-Lynn Evans relates that the motivation for her project to document the culture of the region grew from her experiences as a child when she watched her grandparents lose their land for the USACE East Lynn Lake Project (Mari-Lynn Evans in Evans and others 2004).

A recently published book about East Lynn also demonstrates the attachment to the land found in the study area. Robert Michael Thompson, a 2006 graduate of East Lynn High School, researched local libraries and interviewed older members of the community to produce a memoir of the town in *East Lynn Booming: The Story of a Coal Town and other Tales from the Twelvepole Valley.* Thompson related the local feeling that after the fire in 1955, which destroyed nine buildings and left 24 people homeless, the town began its final decline. Older generations recall a vibrant community that "boasted a train station, movie theaters, doctor's offices, clothing and furniture stores." (*The Wayne County News* 2007).

3.8.1h2 Coal Mining History and Values

The dominance of the coal industry and mining practices has profoundly affected the communities and residents of the Appalachian coalfields since coal mining came to the region. A phenomenon found in many parts of the U.S. in the first half of the 20th century, the mining company provided the essential aspects of community life: work, shopping, education, retail merchandising, and medical care. Research shows that while company towns were common in many industries in the mid-20th century, the relative isolation of the mining communities, the dominance of the coal industry, and the poverty of the Appalachian region enhanced the influence of the company towns (Jones, Jr. 2003).

Significantly, the companies were responsible for providing much of the infrastructure of the region. Maintenance of the infrastructure suffered as the company towns disappeared. Dilapidated, abandoned housing, lack of potable water and closing of local schools were common. It has been challenging for local communities to develop the civic structure to take over the infrastructure systems, even though the transition was aided by the Appalachian Regional Commission. Ronald Lewis (2004) also notes that as coal companies "built the mine, [and]… also became the miners' landlord, offered police and fire

protection, erected the churches and stores, and provided the utilities and other services that towns required," democratic ideals were overlooked and underdeveloped.

Unions–Unionization came late to the central Appalachians. At the turn of the nineteenth century, conditions in bituminous mines led to the formation of a national union (Lockard 1998). However, the cultural traditions of the Appalachians–from the impassible terrain to the "independence" of the Scots-Irish–were less fertile than the organization required for unionization (Evans and others 2004). Mine owners branded unionization as "socialist" and "communist," concepts of community organization that residents found incompatible with their values. The mine companies also claimed that union demands would break company banks and make mining unprofitable. Further, miners in these areas, who mostly lived in company towns tucked into isolated hollows between hills, were bound by contracts which guaranteed the loss of their jobs and homes should they participate in union activity (Kahn 1973).

Unionization and technology converged to change work conditions in the mines. As coal mining became more mechanized, jobs became more skilled, relatively high paying but less available. Nearly one out of every two mining employees lost their jobs in southwestern Virginia in the nine years between 1987 and 1996 (USEPA 2003).

The social environment of coal mining communities has changed as a result. As job descriptions have become increasingly specialized, miners are no longer trained to do most jobs in the mine and their ability to share work or assist a co-worker is no longer expected. Along with other social changes, a skilled and specialized workforce more frequently commute rather than living in the small towns, and the company-town system has disappeared. Meanwhile, female employment in Appalachia has been more widely accepted than in the rest of the country, likely as an economic necessity (USEPA 2003).

3.8.1h3 Recreation and Ties to the Natural Environment

Recreation is a resource-based activity. Tourists come to take in the uncommon qualities of a place. The attraction may be the rugged and scenic uplands, distinctive climate or vegetation, or archaeologic and historic significance that tourists seek. However, the natural resources are valuable only if they can be made accessible and are developed to handle tourist needs (Raitz and Ulack 1984).

Scenic, wooded uplands are abundant in Appalachia. Another advantage of the area is the fact that the region lies with a single day's driving time of almost 70 percent of the U.S. population (Raitz and Ulack 1984). In the 1960s, the ARC was established by the federal government as part of the "War on Poverty." The ARC worked to establish transportation systems that would bring tourists to the area to enjoy the natural beauty and recreation that could be enjoyed in the wild. In the 1970s, the USACE built dams for flood control that also provided lakes for recreation (Evans and others 2004).

Public concern for the long-term environmental effects of large-scale logging taking place across the region provided early motivation for establishing parks in Appalachia. Since the 1880s valuable timber species were exploited. Wooded uplands were burned extensively and the thin soils were exposed to severe erosion. Erosion caused the valleys to flood frequently and silt clogged the streams (Raitz and Ulack 1984).

The process of establishing public lands was met with ambivalent feelings among the long-time residents. While parks and national forests in the western states were created by converting land already in the

public domain, the Appalachian lands consisted of large parcels frequently held by out-of-state speculators, uncooperative lumbermen, or occupied by squatters who held no clear title (Raitz and Ulack 1984). Of the local landowners, many refused to leave; others sold but harbored hard feelings (Evans and others 2004).

Many of the jobs created by the tourist industry are low-paying construction or service jobs. The average tourist season may be as short as three months, so that the economic improvements promised by tourism are now debated (Raitz and Ulack 1984). Also, the popularity of some recreational activities, particularly ORVs, is now recognized to be very damaging to the environment.

3.8.1i Social and Economic Conditions–Community Organizations and Services

3.8.1i1 Schools

The Wayne County School District serves the planning area. Thirteen elementary schools, six middle schools, and two high schools constitute the planning-area school system. The 21 schools within this district had a total enrollment of 7,581 students during the 2005-2006 school year. Schools in the district host high numbers of students qualifying for free and reduced lunch, with all but 7 of the 21 schools with more than 50 percent of the students qualifying. Percentages range from a high of 91 percent at an elementary school to a low of 39 percent at a middle school (National Center for Education Statistics 2007).

The *Wayne County News* (November 17, 2007) reported that all of the Wayne County schools have achieved full accreditation by the state Department of Education's Office of Performance Audits. Five schools–Kelloff, Kenova and Lavalette Elementary Schools, and Buffalo and Vinson Middle Schools–earned the Distinguished accreditation status. Especially in the unincorporated areas, schools are the center of civic life.

The Wayne County Board of Education could receive a portion of the federal coal revenues over the 10- to 15-year period that mining would occur should the Proposed Action and RFDS be implemented. Property taxes are a major income source for county governments and school districts in West Virginia. Approximately 68 percent of property tax revenues are allocated to schools and these revenues account for roughly 30 percent of the typical school district budget (USEPA 2003).

3.8.1i2 Emergency Services

Emergency services such as law enforcement, medical and fire fighting are supplied by the local communities. Local rescue squads and fire departments are the primary responders. The Wayne Fire Department/Rescue Squad (Wayne Rescue) is the primary handler of all ambulance requirements. Tri-County Rescue is the other primary ambulance service in the area. Wayne Rescue has recently added a dive team to their squad that assists in drowning rescue and other water emergencies. A list of all fire departments, rescue squads/ambulances in the immediate area is provided below (USACE 2006a):

- East Lynn Fire Department
- Wayne Fire Department/Rescue Squad

- Lavalette Fire Department/Rescue Squad
- Dunlow Volunteer Fire Company
- Tri-County Rescue
- Wayne County Dispatcher

All emergency services may be accessed by dialing 911. On the USACE East Lynn Lake Project, public phones are available at the East Fork Campground and Lakeside area (Smith 2007e).

The USACE Ranger is a first response emergency medical technician **(**EMT) and can supply first response medical attention. Additionally, USACE provides public safety education through bulletin boards, personal contacts, media, the Interpretive Services Program, or other means. A boating safety program is also in place (USACE 2006a). The East Lynn Lake *Operational Management Plan* (USACE 2006a) also has emergency procedures for public emergencies. Because emergency service use has historically remained steady, aside from the increased ORV use during the last five years, emergency service activities are expected to remain steady in the future (Smith 2007e).

Emergency Services–Law Enforcement–The City of Huntington and Cabell and Wayne Counties are well supplied with local services including emergency service personnel. The West Virginia State Police employs 661 officers throughout the state (West Virginia State Police 2007). The City of Huntington maintains its own police department with 90 full-time personnel and its own fire department with 116 full-time personnel. Law enforcement in unincorporated areas is provided by the Sheriff's Department with emergency fire and medical services supplied by a combination of full-time professional staffs and volunteer organizations.

Wayne County provides several law enforcement services. These services include the West Virginia State Police Wayne County Detachment, employing 8 officers (West Virginia State Police 2007); the Wayne County Sheriff Department (located in the town of Wayne), employing 15 officers (Wayne County Sheriff Department 2007); the town of Wayne Police, employing one full-time officer (Town of Wayne Police 2007); the Ceredo Town Police; the Fort Gay Town Police; and, the Kenova Town Police.

Emergency Services–Fire Services**–**The West Virginia State Fire Marshal Office has a total of 34 sworn fire marshals (Carrico 2007). There are a total of 445 fire departments and volunteer fire departments in West Virginia (West Virginia State Fire Marshal Office 2007). The City of Huntington Fire Department, with 110 fire fighters and fire officers, provides fire and emergency services to the region. The department includes 9 fully staffed firefighting companies with a complement of support staff responding from six stations located throughout the city (City of Huntington 1999).

Fire emergency services in Wayne County are provided by the West Virginia State Fire Marshals; Wayne Volunteer Fire Department, consisting of 38 volunteer firefighters; Ceredo Volunteer Fire Department; Dunlow Volunteer Fire Department; East Lynn Volunteer Fire Department; Fort Gay Fire Department; Kenova Volunteer Fire Department; Layalette Volunteer Fire Department; and Prichard Volunteer Fire Department.

Emergency Services–Medical Facilities**–**Several medical facilities serve the communities of Wayne County. These include the Wayne County Health Department; Cabell Huntington Hospital; St. Mary's Hospital (located in Huntington); Huntington State Hospital; HCA Riverpark Hospital; Three Rivers

Hospital (Ashland, Kentucky); and Williamson Memorial Hospital. There are approximately 51 doctors and medical facilities, and 16 medical specialists and specialty facilities, within the vicinity of the proposed mining project area.

St. Mary's Hospital, located in the Cabell County portion of the city of Huntington, is the largest hospital in the vicinity of Wayne County. The hospital has 393 beds and more than 2,000 employees (St. Mary's Medical Center 2006).

RUPRI (2006) reports that Wayne County is "medically underserved." This designation is based on an index of four variables–the ratio of primary care physicians per 1,000 population, the infant mortality rate, the percentage of the population with incomes below the poverty level, and the percent of the population age 65 and over–as devised by the U.S. Health Resources and Services Administration (HRSA). Much of the State of West Virginia is considered medically underserved by this definition.

Wayne County is also designated a "health professional shortage area" based on the definition of the HRSA, which is an area that "may have shortages of primary medical care, dental or mental health providers." Again, most of the State of West Virginia is included in this designation (RUPRI 2006).

3.8.1i3 Stakeholder Groups

Groups that would be affected by an activity are referred to as stakeholder groups. Stakeholder groups include:

- local communities, community organizations, community leaders,
- recreationalists,
- environmentalists ,
- non-profit organizations,
- business owners,
- people with commercial interests, and
- people with political and social interests.

Stakeholder groups often consider several socioeconomic concepts to be important, such as:

- economic growth,
- visions for the future of the community,
- concerns regarding social and economic affairs related to the community, and
- opinions or issues regarding the effects of the proposed mining on socioeconomic resources.

For the East Lynn Lake Coal Lease LUA/EIS, socioeconomic and social considerations throughout the planning area are consistent among the diverse group of stakeholders: local residents, commercial interests, recreationists, and nature enthusiasts.

Stakeholder Groups–Local Residents–The people who live in or near an area where development is proposed can be the stakeholder group with the most to gain or lose if the proposed project is

implemented. In the mountainous terrain where the proposed lease tracts are located, the residential population is low and dispersed.

Almost 20 percent of both Applicants' employees live in or near the four communities closest to the proposed lease tracts–East Lynn, Genoa, Dunlow, and Wayne (table 3.8-5). Another 13 to 19 percent live in other communities within Wayne County. An additional 37 to 51 percent live in the adjoining counties.

Other employment opportunities in Wayne County include jobs primarily in the service industry, but also in trade, manufacturing, transportation and construction (table 3.8-8). However, the unemployment rate in Wayne County is 6.6 percent (table 3.8-7), and the economic growth rate for the county is negative.

Stakeholder Groups–Businesses–Regional and local businesses that would supply goods and services to a proposed project, as well as those that would receive end products from the proposed project, are also stakeholders. Numerous regional and local businesses provide the following types of services to the two Applicants' existing facilities near the proposed lease tracts:

- conveyor and belt splicing services
- conveyor structure suppliers
- hydraulic rebuild shops and machine shops
- stone and gravel suppliers
- uniform cleaning and purchasing
- safety equipment suppliers (boots, safety glasses, reflective materials, gloves, hearing protection)
- cleaning product suppliers
- petroleum product suppliers (lubricants, hydraulic fluids, and fuel)
- chemical suppliers (preparation plant materials, as well as dust suppressants)
- local mechanics (both on site and off site)
- roof support suppliers (roof bolt, wood product, steel arch)
- coal sampling, coal analysis, water sampling, and water analysis
- engineering services (designing and permitting)
- general mine part and equipment suppliers (miner bits, rail, ties, drill steel, high voltage cables, equipment cables, underground communications, etc.)

Stakeholder Groups–Non-Governmental Organizations–Non-governmental organizations (NGOs) are citizen groups organized around a cause, such as economic issues or the environment. Proposed projects of this magnitude frequently draw the interest of NGOs, especially industry advocacy groups and environmental groups.

Appalachian coalfield residents have a unique social and cultural connection to the natural environment. For coal field residents, the quality of the natural environment is important both as a source of income and an integral element of Appalachian culture (USEPA 2003). Controversy surrounding mining impacts to

the environment and local economies are now expressed in the organization of non-profits and community grass-roots groups organized to protest or mitigate these impacts.

The following advocacy organizations have formed around nearby projects and may monitor major projects in this area (Evans and others 2004; Loeb 2003):

- Coal River Mountain Watch
- Appalachian Center for the Economy and the Environment
- Ohio Valley Environmental Coalition
- West Virginia Highlands Conservancy
- West Virginia Environmental Coalition
- West Virginia Citizens Action Group
- West Virginia Citizens Coal Council
- West Virginia Organizing Project

A newly formed organization, the Concerned Citizens for East Lynn Lake Development (CCELLD), also monitors and comments on planned resource development in the area. As demonstrated by the development of these groups, support for coal mining–especially strip mining–in "post-industrial" Appalachia may diminish as fewer jobs are related to mining and there is a perception of "enduring problems unique to mining" (Lewis 2004).

3.8.2 Environmental Consequences

3.8.2a Scoping Issues

Forty-five comment letters containing a total of 94 comments were received during the scoping period. Fifty of the 94 scoping comments addressed socioeconomic issues associated with the proposed coal lease. Six of the scoping comment letters were received from the local communities: Genoa (1); Dunlow (4); and, Wayne (1).

Many supportive comments cited the continuation of jobs and contribution to the local economy. At least five local and regional vendors submitted comments during the scoping period. These vendors noted that if the proposed mining were to be implemented, their businesses would benefit from the multiplier effect: the extension of existing mining would provide continued opportunities to sell their products to the successful bidder(s).

Representatives of the WVCA, the Brooks Bird Club, and the West Virginia Highlands Conservancy attended the November 6 public scoping meeting. In addition, the WVCA submitted comments supporting the economic benefit that would be gained if the Proposed Action is selected and the proposed mining is implemented.

3.8.2a1 Socioeconomic Workshop for the East Lynn Lake Coal Lease LUA/EIS

In addition to the scoping comments, the BLM held a public socioeconomic workshop facilitated by an economist on March 27, 2007. Attendees had the opportunity to discuss economic growth and visions for

the future of their communities, as well as to express concerns regarding social and economic affairs related to their community. Local residents expressed concern about potential impacts to the environment and to public and private recreational opportunities at East Lynn Lake.

Socioeconomic concerns focused on the impact of trucking, impact to water resources (many people get potable water from wells), and any potential impacts to the natural environment. In addition, other socioeconomic concerns concentrated on the monetary benefits to Wayne County and the local area through royalties and other revenues: how revenues will be allocated; the BLM's priority related to financial impacts; costs of coal mining to the community; and the possibility of using revenues to fund improvements to the park and lake lodge, further having a greater local economic benefit.

3.8.2b Significance Criteria

Demographic, social, and economic indicators were used to assess potential impacts to socioeconomic resources:

- outmigration
- social institutions
- condition of natural resources
- recreation opportunities
- employment, unemployment, and overall job growth
- earnings
- taxes and other forms of revenue to private companies and federal and local governments
- trends in economic sector growth

If significant impacts to natural resources such as water, plants, or animals at the USACE East Lynn Lake Project were to occur, then recreation at the USACE East Lynn Lake Project may be significantly impacted. These impacts could in turn significantly impact social and/or economic resources. If significant impacts to employment, job growth or decline, sector growth or decline, or revenues would be expected, then the economic impact would be considered significant.

3.8.2c Impacts–Proposed Action (Preferred Alternative)

If the Proposed Action is selected and the RFDS is implemented, the local community would have more time to adjust to changing social conditions as the transition from a coal economy takes place. No significant negative impacts to social conditions would occur. Significant positive impacts to economic conditions would occur.

Based on a coal price of $43/ton, the regional economy would receive up to approximately $1,129,900,000 as the successful bidder(s) earned revenue on the sale of processed federal coal. Assuming the customary 8 percent royalty is collected by the MMS, the federal government would receive up to approximately $90,400,000 over the 10- to 15-year life of the project.

West Virginia Statute §20-3-18 directs the state auditor to allocate state revenues received from the federal government according to the method of allocation specified by the *Flood Control Act of 1946* (33 USC Sec. 701c-3).

West Virginia Statute §20-3-18 states:

> **Disposition of flood control, navigation and allied funds from the federal government.**
>
> Receipts from the treasurer of the United States, paid to the state or its proper officers pursuant to direction of an act of Congress relating to disposition of funds received on account of the leasing of lands for flood control, navigation and allied purposes, are to be allocated by the state auditor to each county in accordance with the method of allocation specified by the federal government. Interest or other earning accrued upon investment of the receipts pending allocation thereof shall be allocated to the recipients of the allocations in proportion to each recipient's allocation of the receipts. The state auditor shall transfer to the road commission fifty percent of the funds so allocated to each county for the purpose of maintenance of feeder and state local service roads in the area or areas of the county in which the flooded lands are located. Fifty percent of the funds so allocated to any county in which the lands are located are to be paid by the state auditor to the board of education of that county to be expended by the board for the benefit of the public schools of the county.

In this case, 75 percent of royalties and rentals from mineral leases and other leases on flood control and navigation property are to be distributed to the state and 25 percent would be retained by the federal government. According to state statute, the state would then distribute 50 percent of its receipts to the county road commission and 50 percent to the county board of education (Rollyson 2008).

Under the conditions outlined above, the federal government would retain approximately $22,600,000 of the royalty payments. The State of West Virginia would receive approximately $67,800,000 which would be distributed according to state statute. The Wayne County Board of Education and the Wayne County Roads Department would each receive about $33,900,000. Because the expected impacts would be positive, no mitigation is recommended.

If the Proposed Action is selected and the RFDS is implemented, and if the Applicants are the successful bidders, Rockspring would be able to extend the life of its existing, adjoining mining, processing, and waste storage facility operations by 5 to 10 years, and Argus would be able to extend the life of its operations by 10 to 15 years.

Mining jobs and related economic benefits to Wayne County and the region would continue as the lives of the mines would be extended. Based on multiplier effects for West Virginia calculated in IMPLAN (WVDO 2007), these jobs would be magnified by multiplier effects, estimated to be 1.4 indirect and induced jobs supported by each mining job, indirect and induced wages and benefits of 60 cents per dollar of mining industry wages, and an additional 36 cents per mining dollar in state and local taxes paid by spin-off businesses and their employees in taxes.

3.8.2c1 Impacts–Proposed Action–Social Resources

Social institutions such as churches and schools are stressed by decreasing and aging populations. While Wayne County has thus far been able to absorb population losses and maintain healthy education levels for the elementary and high school population, and many churches and civic organizations have maintained at least a core membership, governmental and mining company support have contributed greatly to this stability.

Existing minor impacts to infrastructure–traffic and impacts to road surfaces–would continue. However, the continued state and local tax revenues would be applied to maintenance and funding projects as projected by WVDO.

No significant new impacts to natural resources are expected:

- No impacts to recreational areas or facilities of the East Lynn Lake area are expected because minimal to no subsidence is expected and no significant impacts to water, soils, plants, or animals are expected.
- The existing minor, localized impacts to natural resources resulting from coal mining–noise and entrainment of dust–would continue for the additional time period.
- No impacts to the dam or the lake itself are expected, and no impacts to flood protection services are expected.
- No significant impacts to water quality or quantity are expected, so no impacts to local residents' water wells are expected.

Regional, state, and local plans are to transition Wayne County's economy from one based on coal and other natural resources to one that relies more on recreation and services. If the economy should deteriorate and out-migration increase, social institutions are likely to face issues of financing and support that will threaten the social web of the area. Under the Proposed Action, sustained economic conditions, and continued mining company philanthropy would likely assist the community in maintaining social institutions.

3.8.2c2 Impacts–Proposed Action–Economic Resources

Existing impacts to economic resources–such as employment and property and employment taxes–also would continue to occur, which would contribute to maintaining the existing quality of life.

No negative economic impacts would occur under the Proposed Action. Instead, beneficial impacts to economic conditions would occur. The successful bidder(s) would receive coal sales revenue, the federal government and Wayne County would receive tax revenue, and the USACE would continue to be able to collect recreation fees.

Job growth in Wayne County is occurring in lower paying service jobs, and fewer high skilled jobs are being created. If the Applicants are the successful bidder(s) and the RFDS is implemented, the Applicants would be able to extend the 500 to 600 jobs they currently provide for another 10 to 15 years. Multiplier effects on employment, earnings, and indirect output also would continue to benefit the local economy. By extending the duration of the mining jobs, wages, industrial output, and taxes and by extending other associated jobs, wages, industrial output, and taxes generated as a result of multiplier effects, the coal companies would help to facilitate the regional economy's transition from a more industrial economy to a more service-based economy. As a result, a sustained level of income would be expected. Current housing trends also would be expected to continue.

Because Wayne County does not have a sizable minority population, this continued economic stability would not affect minority populations. However, extending the duration of these jobs would help to maintain the economy of the region and provide economic opportunities for the poor. Extending these jobs would also be important to sustaining the existing tax base, which includes property tax, income tax,

coal severance tax, and royalties. This reliable tax base in turn would extend existing access to government services for the poor.

3.8.2d Impacts–No Action

If the No Action Alternative is selected and the NAS is implemented, the rate of change to social conditions would accelerate as social institutions in Wayne County would likely be threatened by a weakened economy and the loss of mining company philanthropy. Negative impacts to economic conditions would occur. The transition from an industrial economy to a service economy likely would be more difficult with the loss of the two Applicants' mining operations and associated indirect impacts occurring in the next 10 to 15 years. The revenues and royalties expected under the Proposed Action would not be received.

If the No Action Alternative is selected, the NAS would be implemented: the federal coal would remain in place. No additional impacts to natural resources other than those that are occurring due to existing, mining-related activities on private land would be expected under the NAS. No significant impacts to the USACE East Lynn Lake Project lands or facilities–such as the dam, the lake, or the lands surrounding the lake–would be expected. Therefore, no impacts to flood protection services or recreational activities would be expected. No significant impacts to social conditions would be expected.

The existing environmental impacts from on-going coal mining, such as the presence of haul trucks on roads and resulting impacts to the roads, noise, and localized entrainment of dust would continue for the lives of the existing mines. Oil and gas development, legal and illegal ORV use, and hiking would continue on the surface of the proposed lease tracts. However, no significant new environmental impacts would be expected to occur.

3.8.2d1 Impacts–No Action–Social Resources

Under the No Action Alternative, social institutions in Wayne County would likely be threatened by a weakened economy and the loss of mining company philanthropy in the next 10 to 15 years, as coal reserves in the region are exhausted. Fewer jobs could result in increased out-migration, and financing and support of social institutions such as schools and churches likely would decline, threatening the social web of the area.

Existing minor impacts to infrastructure–traffic and impacts to road surfaces–would continue. However, the reduced state and local tax revenues could delay maintenance and funding projects as projected by WVDO.

3.8.2d2 Impacts–No Action–Economic Resources

Under the NAS, the Applicants would continue to operate their existing, adjoining operations for another 10 to 15 years. The existing impacts to economic resources, such as employment and property and employment taxes also would continue to occur during that 10- to 15-year period. However, at current production rates, the Applicants would likely exhaust their current reserves on adjoining private lands in approximately 10 to 15 years, around 2019 to 2024. The companies may be able to acquire additional reserves that they could haul to their existing facilities to process. Also, the companies could reduce production rates to extend the lives of the facilities for several more years. When the Applicants do close

their operations, the roughly 500 to 600 people currently employed at these facilities would lose their jobs. A decline in income would be expected due to the loss of jobs. A decline in demand for housing also would be expected.

Accessing the federal coal by surface means is not practical. As the Applicants continue their existing mining operations, underground access to the federal coal would become more and more limited. Consequently, in time the approximately 25 million tons of federal coal that lies under the proposed lease tracts potentially could become inaccessible and lost from the reserve base." Using a coal price of $43/ton, up to approximately $1,129,900,000 of potential revenue would be lost from the regional economy. Regional coal users would obtain needed coal from other mines in the region or other regions of the U.S.

In addition, using a federal royalty rate of 8 percent applied by the U.S. Minerals Management Service on the sale of federal coal from underground mines, the federal government would lose the opportunity to receive up to approximately $22,600,000 in federally-retained royalties. That loss might be permanent, because access to the federal coal could become infeasible if the No Action Alternative is selected and existing mining activities render the coal inaccessible by underground measures.

Most importantly, the Wayne County Board of Education and the Wayne County Roads Department would lose the opportunity to receive distributed federal royalties totaling up to approximately $67,800,000.

Under the No Action Alternative, mining jobs and related economic benefits to Wayne County and the region would eventually disappear as the life of the existing mines is exhausted. These job losses would be magnified by multiplier effects, estimated to be 1.4 indirect and induced jobs supported by each mining job, indirect and induced wages and benefits of 60 cents per dollar of mining industry wages, and an additional 36 cents per mining dollar in state and local taxes paid by spin-off businesses and their employees in taxes (WVDO 2007).

3.9 ENVIRONMENTAL JUSTICE

NEPA requires an analysis of the environmental impacts to minority and poor communities to assure that they are not burdened with an unfair portion of the impacts of a proposed action. Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-income Populations*, was issued by President Clinton on February 11, 1994 (59 FR 7629). This order requires that "each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities, on minority populations and low-income populations."

Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (Executive Order 13045, 62 FR 19885) states that each federal agency shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. Environmental health risks and safety risks mean risks to health or to safety that are attributable to products or substances that the child is likely to come into contact with or to ingest.

3.9.1 Affected Environment

The socioeconomic study area (figure 3.8-1) for this Proposed Action includes Wayne County. While minority groups are represented by less than 2 percent of the population of Wayne County (less than 5 percent of West Virginia as a whole), poverty is a major concern. As of 2000, 19.6 percent, or nearly one-fifth of the county's population could be classified as "poor," a proportion that is slightly higher than the state average of nearly 18 percent (U.S. Census Bureau 2000, Table DP-3).

3.9.1a Minority Populations

Racial and ethnic data from 2000 for the State of West Virginia are provided in table 3.8-6. The county and the state have predominantly white populations, both with percentages over 95 percent. In 2000, the Latino/Hispanic group formed the dominant ethnic group in Wayne County, comprising 0.5 percent of the population. The Black/African American community was Wayne County's smallest ethnic group, comprising 0.1 percent of the population (U.S. Census Bureau, Table DP-1). At this time, West Virginia has no federally recognized tribes or Native American traditional areas (Anslinger and others 2007).

According to Census 2000, the racial/ethnic makeup of the town of Wayne was very similar to the makeup of the county: 98.0 percent White; 0.5 percent Latino Hispanic (any race); 0.9 percent Native American; 0.5 percent Asian; 0.4 percent from some other race; and 0.1 percent Black/African American (U.S. Census Bureau, Table DP-1). The town of Wayne, according to Census 2000, had a population of 1,105 people, with 486 households and 322 families residing in town.

3.9.1b Low-Income Populations

Wayne County had both a lower per capita income and median household income than the State of West Virginia. The county's population living in poverty also was higher in both 1990 and 2000. Both the county's and state's poverty rate decreased slightly between 1990 and 2000, declining to 19.6 percent and 17.9 percent, respectively, in 2000 (table 3.8-9). RUPRI (2006) reports that the poverty rate in West Virginia in 2003 was 16.3 percent, compared to 12.5 percent for the U.S.

In 2000, the median income for a household in the town of Wayne was $20,242, (table 3.8-9) and the median income for a family was $24,750 (U.S. Census Bureau 2000, Table DP-3). Males had a median income of $27,292 compared to $23,500 for females. The per capita income for the town of Wayne was $11,626. About 25.3 percent of families and 30.3 percent of the population were below the poverty line, including 35.9 percent of those under age 18 and 20.6 percent of those aged 65 or over (U.S. Census Bureau 2000, Table DP-3).

Schools with the highest percentages of students qualifying for free and reduced lunch programs are located in East Lynn (91 percent), Genoa (84 percent), Dunlow (72 percent) and Fort Gay (71 percent). Fourteen of the 21 schools in the county have more than 50 percent of the students qualifying for free and reduced lunches (National Center for Education Statistics 2007).

3.9.1c Age and Gender Distribution

The 2000 Census data indicate that youths and middle-aged people comprise the largest part of Wayne County's population, as shown in table 3.8-3. The median age in the U.S. is 38.1 years. West Virginia's

median age of 38.9 is the highest of any state in the U.S. (WVDO 2003). The median age in Wayne County is slightly lower at 38.4 (U.S. Census Bureau 2000, Table DP-1). RUPRI (2006) reports that the percent of the population in the 20 to 44 age groups is greater in the metro areas, while the percent of the population age 55 and older is greater in the non-metro areas.

The average ratio of men to women in Wayne County is 48.9 to 51.1, similar to the state's ratio of 49.0 to 51.0 (U.S. Census Bureau 2000, Table DP-1).

3.9.2 Environmental Consequences

3.9.2a Scoping Issues

No scoping issues directly addressed environmental justice. Related socioeconomic issues that were specifically mentioned that could impact environmental justice are:

- short- and long-term (including post-mining) economic impacts on a local and regional scale
- impacts to local businesses
- impacts to government services
- tax revenue, and
- cumulative effects related to other future socioeconomic contributions.

The criteria used to assess significance of impacts to environmental justice include any disproportionate burden of environmental or economic impacts on minority or poor communities, including:

- loss of job opportunities
- impacts to personal property, such as subsidence, negative changes in water quantity or quality
- reduced access to government services, and
- reduced access to recreational facilities.

3.9.2b Impacts–Proposed Action (Preferred Alternative)

3.9.2b1 Impacts–Proposed Action–Environmental Justice

If the Proposed Action is selected and the RFDS (appendix B) is implemented, the existing mining jobs in the area would remain in the community for an additional 10 to 15 years. Because Wayne County does not have a sizable minority population, this continued economic stability would not affect minority populations. However, extending the duration of these jobs would help to maintain the economy of the region and provide economic opportunities for the poor (as described in the section 3.8, Socioeconomic Resources). Extending these jobs would also be important to sustaining the existing tax base, which includes property tax, income tax, coal severance tax, and royalties. This reliable tax base in turn would extend existing access to government services for the poor.

With regard to environmental justice, the location of the mine is determined by the geologic setting of the coal resource. Coal companies construct mine facilities near the coal resource out of necessity to handle

the coal as it is removed from the ground, and to reduce economic costs associated with transporting the coal to a processing facility. Constructing an underground mine limits the environmental impacts that would affect environmental justice communities, if they existed as discrete communities. Because coal is the historical, as well as current, economic base, development of the federal coal would benefit the whole community.

As the resource is depleted, the community would need to transition to other economies. Regarding the East Lynn Lake Coal Lease, if the Applicants are the successful bidder(s), Rockspring would be able to extend the life of its existing, adjoining operations by 5 to 10 years, and Argus would be able to extend the life of its existing, adjoining facilities by 10 to 15 years, simultaneously extending employment for 500 to 600 workers.

The affordable recreation of the East Lynn Project area, as described in section 3.12, would not be affected by implementing the RFDS and these activities (camping, swimming, fishing, wildlife observation and hunting, hiking, picnicking) would still be available to poor communities as well as the more prosperous.

No negative impacts to minority or low-income populations are expected. No disproportionate impacts of the proposed mining associated with the Proposed Action are considered to be environmental justice issues. Positive impacts are anticipated to socioeconomic resources that would benefit the entire community through extended employment, expected severance taxes and royalties, and the multiplier effects of this income.

3.9.2b2 Impacts–Proposed Action–Protection of Children

With regard to the protection of children, the proposed mining associated with the Proposed Action would involve underground mining and would have minimal surface impacts. No significant impacts to environmental health are expected, so no significant impacts to children are expected. Positive impacts are anticipated to socioeconomic resources that would benefit the entire community through extended employment, expected severance taxes and royalties, and the multiplier effects of this income.

3.9.2c Impacts–No Action

3.9.2c1 Impacts–No Action–Environmental Justice

Under the No Action Alternative, mining jobs would disappear when the life of the existing mines is exhausted, in about 10 to 15 years. The loss of jobs would negatively affect the socioeconomic framework of Wayne County, and significantly reduce the tax base. Access to job opportunities and government services for the poor would be detrimentally impacted.

With regard to environmental justice, no significant disproportionate impacts to minority populations are expected under the NAS. Access to job opportunities and government services for the poor would be detrimentally impacted for the whole community.

3.9.2c2 Impacts–No Action–Protection of Children

With regard to the protection of children, the NAS associated with the No Action Alternative would involve no mining of the federal coal. No impacts to environmental health are expected, and no impacts to children are expected.

3.9.2d Mitigation Measures

No significant environmental impacts that would disproportionately impact minority or poor parts of Wayne County are expected if the Proposed Action is selected and the RFDS is implemented. Positive economic impacts for poor and minority communities of Wayne County are expected if the Proposed Action is selected and the RFDS implemented. As a result, no mitigation measures, beyond those proposed for specific environmental impacts, are proposed.

3.9.2e Residual Impacts

Because no significant environmental impacts that would disproportionately impact minority or poor parts of Wayne County are predicted if the Proposed Action is selected and the RFDS is implemented, no residual impacts are expected.

3.9.2f Monitoring Recommendations

Because no significant environmental impacts that would disproportionately impact minority or poor parts of Wayne County are predicted if the Proposed Action is selected and the RFDS is implemented, no monitoring beyond those proposed for specific environmental impacts is recommended.

Positive economic impacts for poor and minority parts of Wayne County are expected if the Proposed Action is selected and the RFDS implemented. Workforce West Virginia and the Wayne County Economic Development Association would provide economic statistics on a regular basis that could be used to monitor economic developments.

3.10 CULTURAL RESOURCES AND CEMETERIES

In this study a **cultural resource** is defined as any district, site, building, structure, or object 50 years of age or older. Included are cemeteries, which are known to exist on private lands within the perimeter boundary of the proposed lease tracts. **Historic properties** are defined as cultural resources listed, or eligible to be listed, in the National Register of Historic Places (NRHP). The NRHP standards require that a cultural resource possess both historical significance and integrity. Significance may be found in four aspects of American history defined by the following criteria:

- association with historic events or activities
- association with important persons
- distinctive design or physical characteristics
- potential to provide important information about prehistory or history

Integrity must also be evident through qualities including location, design, setting, materials, workmanship, feeling, and association.

Cemeteries are not typically eligible for NRHP protection. Exceptions are: a grave of a historic figure of outstanding importance, if there is no other appropriate and/or surviving site or building directly associated with his or her productive life; or a cemetery that derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events.

Cultural resources are managed in accordance with several federal laws, regulations, and guidelines, including: NEPA, the *Archaeological Data Preservation Act of 1974* (also known as the *Moss-Bennett Act*), the *American Indian Religious Freedom Act of 1978*, the *Archaeological Resources Protection Act* (ARPA) *of 1979*, the *Native American Graves Protection and Repatriation Act of 1990*, and Executive Orders 11593, 12072, 13006, 13007, and 13175. Cultural resources are also given consideration under several West Virginia state laws and regulations. For example, West Virginia Code (Title 29 Section 1-1) creates the West Virginia Division of Culture and History (WVDCH) to identify and register cultural resources worthy of preservation. West Virginia's historic preservation laws and regulations have been compiled by the National Conference of State Historic Preservation Officers and are available on their Web site (NCSL 2004).

In this study, effects to historic properties are considered under USC 470f [Section 106 of the *National Historic Preservation Act of 1966* (NHPA), as amended] and the implementing regulations found at 36 CFR 800. Because the proposed lease tracts surround several cemeteries located on private lands, West Virginia Code §37-13A, which provides protection to cemeteries, is also considered.

On August 27, 2007 the BLM received a written response (reference FR# 07-97-WA-2, dated August 20, 2007) from the West Virginia Deputy State Historic Preservation Officer, concurring with the Agency's opinion of no effect on historic properties. The West Virginia State Historic Preservation Office (WVSHPO) considered the undertaking's potential to affect archaeological as well as architectural resources which may be eligible for listing on the National Register. The Class I Cultural Resources Overview, completed on behalf of BLM, was determined sufficient for their review.

WVSHPO did, however, ask the BLM to be mindful of subsidence underlying family cemeteries in and around the planning area. This concern has been raised from other state agencies. Subsidence issues are considered in other sections of this EIS, but there are no current concerns with subsidence underlying the known cemeteries within the planned areas of potential effect (APE).

3.10.1 Affected Environment

The affected environment for cultural resources generally corresponds to the APE for the proposed lease tracts. As defined by 36 CFR 800.16 (d) the APE is:

> …the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The [APE] is influenced by the scale and nature of the undertaking and may be different for different kinds of effects caused by the undertaking.

A project can have multiple APEs depending on its size and nature. The BLM determined that the APE for cultural resources for the East Lynn Lake Coal Lease LUA/EIS was the footprint of the proposed lease

tracts (Anslinger and others 2007), including 12 privately owned parcels containing cemeteries located within the perimeter boundary of the proposed lease tracts.

To identify previously recorded and/or potential cultural resources within the affected environment, a *Class I Cultural Resources Overview of The East Lynn Lake Coal Lease Stonewall District, Wayne County, West Virginia*, referred to in this FLUA/FEIS as the Class I Overview (Anslinger and others 2007) has been completed. The Class I Overview followed guidelines in BLM's Manual on *Identifying and Evaluating Cultural Resources* (BLM 2004). The Class I Overview was defined as an existing information inventory, and did not include field reconnaissance. The primary goals of the Class I Overview are to:

- identify and describe the known cultural resources located in the proposed lease tracts,
- analyze the known information to identify general patterns of settlement and prehistoric and historic land use in the proposed lease tracts,
- identify potentially significant or sensitive cultural resources located in the proposed lease tracts,
- identify potential impacts the proposed mining operations would have on these cultural resources, and
- develop mitigation measures for the cultural resources located in the proposed lease tracts.

To meet these goals, the Class I Overview (Anslinger and others 2007) included:

- the development of cultural contexts for the prehistoric and historic periods for the region surrounding the proposed lease tracts,
- review and summary of previous cultural resource surveys completed in Wayne County and the westernmost part of adjacent Lincoln County, and
- summary of data for previously documented archaeological sites in Wayne County and the westernmost part of Lincoln County.

The boundary of the proposed Rockspring lease tract A was modified in September 2007, and new information concerning potential cultural resources was obtained. The following sections incorporate the new information with the results of the Class I Overview to identify the known and potential cultural resources located within the affected environment.

3.10.1a Results of the Class I Overview

Relevant findings of the Class I Overview (Anslinger and others 2007) were: 1) little area within the proposed lease tracts has been examined for cultural resources, and 2) the natural environment within the proposed lease tracts is sufficiently rich to have attracted both Native Americans and Euro-Americans. Based on these findings, the potential for undocumented historic and prehistoric cultural resources to be present in the proposed lease tracts is high.

3.10.1a1 Buildings and Structures

No buildings or structures have been systematically inventoried or evaluated for significance within the affected environment, nor is there record of this area having been examined systematically to identify

buildings or structures greater than 50 years of age. The Class I Overview reports that above-ground cultural resources within the USACE East Lynn Lake Project area were razed during the 1960s following the purchase of the land by the USACE (Anslinger and others 2007). The USACE indicates that structures of possible local significance or interest to visitors are present (USACE 2006a), but it is not known if these structures are located in the APE. There is no record of any structures within the proposed lease tracts having been evaluated for the NRHP.

3.10.1a2 Prehistoric Archaeological Sites

Using data for Wayne County and part of adjacent Lincoln County, the Class I Overview (Anslinger and others 2007) found that the most extensive prehistoric use of settings similar to the proposed lease tracts took place during the Archaic and Woodland temporal periods. In fragmented upland of southern West Virginia archaeological sites associated with these periods are commonly identified on ridgetops and in rockshelters, and most likely represent the remains of short-term camps and other types of temporary sites.

During the Class I Overview, two prehistoric sites were identified within the boundaries of the proposed lease tracts:

Site 46Wa2 is reported as two stone mounds, one of which is located inside the former location of the Fry Family Cemetery and the other is adjacent to the cemetery. The mound located at the former location of the Fry Family Cemetery is outside of the proposed lease tracts. Archaeological testing of the second mound failed to discover evidence of prehistoric construction or use, and its origin remains uncertain (McMichael and Mairs 1965).

Site 46Wa14 was tested prior to the construction of the East Lynn Lake dam (McMichael and Mairs 1965). Animal bone, mussel shell, chert flake debris, and possible wood ash were discovered. The age and cultural affiliation of the site were not established because diagnostic artifacts were absent.

The current condition of these two sites is not known, and formal determinations of eligibility have not been completed. The USACE does not consider either site eligible for inclusion on the NRHP (USACE 1995, Anslinger and others 2007).

Although a systematic survey to identify prehistoric period archaeological sites within the affected environment has not been completed, existing data indicate there is a high potential for the presence of undocumented prehistoric sites.

3.10.1a3 Historic Period Archaeological Sites

In the historic period, environments similar to the proposed lease tracts were used extensively by forest farmers and by the logging, mining, and natural gas industries. A systematic survey to identify the remains of historic period activities in the proposed lease tracts has not been completed, and historic period cultural resources have not been inventoried within the proposed lease tracts.

Historic evidence suggests that gas wells, mines, farms, dwellings, schools, churches, and cemeteries occupied the affected environment during the nineteenth and twentieth centuries. These uses of the landscape typically have associated archaeological deposits, which can remain intact after above-ground

components have been destroyed. The potential for the presence of cultural remains associated with historic period use and occupation in the affected environment is high.

As part of the Class I Overview (Anslinger and others 2007), researchers reviewed several twentieth century maps, and identified locations of historic period activities within the affected environment that may have associated archaeological deposits. In addition, the USACE maintains documents, maps, and some photographs showing previous house sites within the East Lynn Lake footprint (USACE 2006a).

The USACE (2006a) has reported the remains of a log house near the trail at the East Fork Campgrounds, although this resource has not been systematically documented, researched, or evaluated. The USACE (2006a) has also reported that several historic drift mines are located within the USACE East Lynn Lake Project area. The remains of one mine along the Lakeside Trail are reported as the possible location of a NRHP eligible historic property. However, this location has not been systematically documented, researched, or evaluated. The other drift mine locations have not been documented because of safety concerns (USACE 2006a).

3.10.1a4 Cemeteries

Twelve cemeteries are known to exist on private lands within the perimeter boundary of the proposed lease tracts (Anslinger and others 2007; Argus 2006a; USACE 2007b) (table 3.10-1 and figure 3.10-1). These cemeteries have not been formally documented or evaluated for inclusion in the NRHP, and their current conditions are not known.

Table 3.10-1
Cemeteries Reported within the Affected Environment for Cultural Resources

Cemetery	USGS 7.5' Quad	NAD	Zone	Easting	Northing	*Source*
Frasher	Kiahsville	1927	17	384274	4219389	*Anslinger and others 2007* *USACE 2007b*
Sam Queen	Kiahsville	1927	17	387051	4212373	*Anslinger and others 2007* *USACE 2007b*
Pat Maynard	Kiahsville	1927	17	383309	4213027	*Anslinger and others 2007* *USACE 2007b*
Muck Maynard	Kiahsville	1927	17	382330	4214332	*Anslinger and others 2007* *USACE 2007b*
Alvis Maynard	Kiahsville	1927	17	380758	4215159	*Anslinger and others 2007* *USACE 2007b*
Sally Smith	Kiahsville	1927	17	380321	4215258	*Anslinger and others 2007* *USACE 2007b*
George Finely	Kiahsville	1927	17	381003	4213619	*Anslinger and others 2007* *USACE 2007b*
Frazier	Kiahsville	1927	17	384742	4220067	*Anslinger and others 2007*
Henry Adkins	Kiahsville	1927	17	383885	4250073	*Anslinger and others 2007* *USACE 2007b*
Mathias	Kiahsville	1927	17	380767	4216043	*Anslinger and others 2007* *USACE 2007b*
Garden	Kiahsville	1927	17	386814	4212145	*Anslinger and others 2007*
Brooks	Kiahsville	1927	17	382582	4213963	*Argus 2006a*

3.10.2 Environmental Consequences

3.10.2a Scoping Issues

The single scoping issue identified for cultural resources was potential impacts to cemeteries (section 1.7).

3.10.2b Significance Criteria

The *National Historic Preservation Act of 1966*, as amended, provides implementing regulations in 36 CFR 800 for agencies to consider the potential for adverse effects to historic properties, and the criteria for historical "significance" relative to listing properties on the National Register of Historic Places.

Significant impacts would be actions that render an otherwise eligible site as ineligible for listing on the National Register. Other significant impacts may include:

- Damage, destruction and exposure of grave sites from family cemeteries
- Loss of historical integrity at cultural and historical sites, including archaeological sites
- Other irretrievable impacts to the historical integrity and eligibility of cultural resources, which could include construction of vent shafts, mining pits and emergency access routes

3.10.2c Impacts–Proposed Action (Preferred Alternative)

If the Proposed Action is selected and the associated RFDS is implemented, the proposed mining is expected to result in limited surface disturbance resulting from:

- minimal surface subsidence and subsequent reclamation
- any necessary emergency rescue operations
- construction of ventilation shafts, or
- exploratory drilling.

An estimate of the surface disturbance from the combination of all these activities is a maximum of 20 acres over a 10-year period (section 2.4). Any potential disturbance would be widely distributed over the approximately 13,000-acre lease tracts, with very small areas of disturbance of a few acres in any specific location.

On this basis, the Proposed Action has low potential to directly or indirectly impact known or potential cultural resources located in the affected environment, including prehistoric sites, historic sites, the 12 known cemeteries located on private lands within the perimeter boundary of the proposed lease tracts, and those sites of local significance or interest to visitors to the USACE East Lynn Lake Project.

Under the Proposed Action, no cultural resources listed in, determined eligible for, or considered eligible for the NRHP per a consensus determination, are expected to be impacted directly or indirectly, as no historic properties are known to be located in the affected environment.

3.10.2d Impacts–No Action

Under the No Action Alternative, direct or indirect impacts to known and potential cultural resources, including cemeteries, would be the same as those experienced under the existing normal operating conditions at the USACE East Lynn Lake Project. No direct or indirect impacts to cultural resources are expected to occur as a result of the implementation of the No Action Alternative.

3.10.2e Mitigation Measures

No significant impacts are expected and, therefore, no mitigation measures are necessary. However, in the unlikely event that impacts are indeed incurred then the BLM, USACE, WVDCH, the tribes and private landowners (for cemeteries only) should complete consultations to identify appropriate mitigation measures.

3.10.2f Residual Impacts

Because no significant impacts are expected, no residual impacts to cultural resources are expected to be incurred under the Proposed Action.

3.10.2g Monitoring Recommendations

Monitoring is not required for cultural resources because no known historic properties are present, and under the Proposed Action, the potential for significant impacts to cultural resources, including cemeteries, is low.

Under the Proposed Action, it is expected that a Phase I archaeological survey would be completed in advance of any planned ground disturbance (for instance, location of a ventilation shaft or exploratory drill site) or following inadvertent ground disturbance (for example, area of subsidence).

3.11 PALEONTOLOGICAL RESOURCES

Paleontological resources are fossils or other physical remains of prehistoric plants and animals which are generally preserved in soils and sedimentary rock formations. These physical remains are important for correlating and dating rock strata and are used for understanding past environments, environmental change, and evolution. Paleontological resources are often separated into five categories:

- vertebrate fossils
- invertebrate fossils
- plant fossils
- pollen spores
- trace fossils

Paleontologists consider a fossil to be scientifically significant if the fossil is unique, unusual, rare, or diagnostically or stratigraphically important. The BLM and the USFS define fossils "of scientific value" that meet on or more of the following criteria (Raup 1987):

- preservation of soft body parts
- preservation of uncommon invertebrate fossils
- close or intimate association of plants with animals
- preservation of the skull, whole isolated bones, or other diagnostic materials
- a concentration and diversity of plants and animals of restricted geologic or geographic range
- fossils poorly known to science
- unique or significant geographic, stratigraphic, or paleontologic position such as type, locality, single known occurrence, reptile-mammal transition, and so forth
- materials having the potential for clarifying the evolutionary position, morphology, development, and/or behavior of the organism and/or its environment

Regulations found at 36 CFR 27 provide the authority for USACE to administer public lands used for water resource development projects, but do not specifically address paleontological resources or collection of specimens. The State of West Virginia also has no law that protects paleontological resources (Blake 2007a).

BLM's *Paleontological Resource Management Plan* (Handbook H-8270; BLM 1998a) provides policy for management that lists objectives, and what public policies give authority to BLM, and when a permit is required. BLM's *General Procedural Guidance for Paleontological Resource Management Handbook* (H-8270-1; BLM 1998b) provides guidance for BLM staff to coordinate planning (assessment and mitigation), permitting, and classifying ranking of areas according to their potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. In October 2007, BLM circulated Instruction Memorandum 2008-009 (BLM 2008a) that presents the potential fossil yield classification (PFYC) system that BLM uses for paleontological resources on public lands. The PFYC system is summarized in table 3.11-1.

Table 3.11-1
Potential Fossil Yield Classification System

Class 1 *Very Low Potential*	Geologic units that are not likely to contain recognizable fossil remains such as igneous (excluding reworked volcanic ash units) or metamorphic rock.
Class 2 *Low Potential*	Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.
Class 3 *Moderate-Unknown Potential*	Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential.
Class 3a *Moderate Potential*	Units are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils.
Class 3b *Unknown Potential*	Units exhibit geologic features and preservational conditions that suggest significant fossils could be present, but little information about paleontological resources of the unit or the area is known.
Class 4 *High Potential*	Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented.
Class 4a	Unit is exposed with little or no soil or vegetative cover. Exposed bedrock areas are often larger than two acres.
Class 4b	The area is underlain by geologic units with high potential.
Class 5 *Very High Potential*	Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate; or plant fossils, and that are at risk of human-caused adverse impacts; or natural degradation.
Class 5a	Unit is exposed with little or no soil or vegetative cover. Exposed bedrock areas are often larger than two acres.
Class 5b	The area is underlain by geologic units with high potential.

Source: Table summarized from BLM (2008)

BLM policy, however, defines a fossil

> …to mean the remains or traces of an organism preserved by natural processes in the earth's crust. The term does not include minerals such as coal, oil and gas, bitumen, lignite, asphaltum, gilsonite, or tar sands, which are controlled by the *Mineral Leasing Act*, even though they are of biologic origin. (U.S. Department of the Interior 1999, Appendix 2).

The MLA excludes minerals used for beneficial use, and this exclusion is confirmed in the USFS regulations found at 36 CFR 261.2:

> …any evidence of fossilized remains of multicellular invertebrate and vertebrate animals and multicellular plants, including imprints thereof. Organic remains primarily collected for use as fuel such as coal and oil are Paleontological Resources, but are excluded from the prohibitions under the rule.

All coal beds are accumulations of plant fossils, and any fossils present in a coal bed are destroyed during mining. However, fossils found within coal are not protected (36 CFR 261.2; U.S. Department of Interior 1999).

Since no paleontological surveys have been documented within the USACE East Lynn Lake Project, the following description of the existing environment and assessment of potential impacts on paleontological resources are based on a literature search and personal communication with the West Virginia state paleontologist, Bascombe Blake (2007b).

3.11.1 Affected Environment

The study area for paleontological resources includes the proposed lease tracts. The affected geologic units are described in section 3.1 and include the Middle Pennsylvanian East Lynn Sandstone, the Middle Pennsylvanian No. 5 Block coal seam, and the lower Pennsylvanian Coalburg/Winifrede coal seam (figure 3.1-3). The references discussed below indicate that fossils (such as invertebrate, pollen spores, trace fossils and plants) are likely to occur within the geologic units found within the USACE East Lynn Lake Project and proposed lease tracts. These fossils, using the BLM (2008) PFYC system, are most likely Class 3b.

3.11.1a Vertebrate and Invertebrate Fossils

While no paleontological studies document vertebrate fossils in Wayne County, West Virginia, vertebrate fossils (amphibian and fish) have been documented in Upper and Middle Pennsylvanian rocks and coal in Ohio and Pennsylvania (Hook and Baird 1988, McComas and Mapes 1988). Martino (1994) lists invertebrate fossils that have been recorded in the Kanawha Formation in southern West Virginia. Blake (2007b) states that no marine fossils are found within the portion of the Kanawha Formation that contains the Coalburg/Winifrede coal.

3.11.1b Pollen Spores and Trace Fossils

In the Middle Pennsylvanian coal beds, pollen spores are well documented (Kosanke 1988, Eble 1994). Trace fossils are also documented in the marine layers, or facies, of the Kanawha Formation (Martino 1989).

3.11.1c Plant Fossils

Plant fossils of the type associated with the coal and shale found on the USACE East Lynn Lake Project are on public display (Smith 2007a). The Coalburg/Winifrede coal seam has a minor potential for casts of lycopod stumps and a minor potential of plant fossils in shale, which typically makes up the roof of an underground coal mine, or in shale partings. Typically, roof shales occur locally while sandstone usually occurs above the coal, and the sandstone usually does not contain plant fossils. Based on available information, no plant fossils would be expected to be present in the geologic formations lying under the proposed lease tracts would be considered scientifically significant.

Blake and others (2002) lists the ranges of selected Pennsylvanian megafossils within the coal beds from the Appalachian region. Of those megafossils, the megafossils that may be found within the Coalburg/Winifrede coal seam are listed in table 3.11-2.

Table 3.11-2
Megafossils Occurring
Within the Coalburg and Winifrede Coal Beds

Taxon	Status
Lepidodendron aculeatum	Does occur in Winifrede and Coalburg coal beds
Sphenophyllum cuneifolium	Does occur in Winifrede and Coalburg coal beds
Asterophyllites grandis	Does occur in Winifrede and Coalburg coal beds
Asterophyllites charaeformis	Does occur in Winifrede and Coalburg coal beds
Annulari radiate	Does occur in Winifrede and Coalburg coal beds
Neuropteris heterophylla	Does occur in Winifrede and Coalburg coal beds
Eusphenopteris obtusiloba	Does occur in Winifrede and Coalburg coal beds
Eremopteris missouriensis	Does occur in Winifrede and Coalburg coal beds
Maropteris nervosa	Does occur in Winifrede and Coalburg coal beds
Laveineopteris tenuifolia	Does occur in Winifrede and Coalburg coal beds
Macroneuropteris scheuchzen	Does occur in Winifrede and Coalburg coal beds
Renaultia schatzlarensis	Does occur in Winifrede coal bed
Alloipteris coralloides	Does occur in Winifrede coal bed
Alethopteris urophylla	May occur in Winifrede and Coalburg coal beds
Annularia stellata	May occur in Winifrede and Coalburg coal beds
Paripteris gigantean	May occur in Winifrede and Coalburg coal beds
Laveineopteris rarinervis	Occurs in the upper half of the Coalburg coal bed
Sphenophyllum Majus	Occurs in the upper half of the Coalburg coal bed
Annularia sphenophylloides	Occurs in the upper half of the Coalburg coal bed

Source: Blake and others 2002

3.11.1d Existing Impacts

Since at least the 1960s, the management of the USACE East Lynn Lake Project has allowed no mining, but has allowed oil and gas development in the vicinity. Oil and gas collection facilities, including drill pads, oil and gas wells, pipelines, and compressor stations exist on the proposed lease tracts. When an oil and gas well is drilled, the drill bit is pushed down into rock, breaking up that rock, including coal and any fossils present in the coal. Therefore, existing oil and gas well activities have likely impacted fossils. This impact is minor because the diameter of the borehole is minimal compared to the total volume of rock.

Local residents have dug shallow house coal mines, typically in the No. 5 Block seam, on the proposed lease tracts in the past. These mines have likely impacted fossils within and in proximity to the coal.

3.11.2 Environmental Consequences

3.11.2a Scoping Issues

No scoping issues for paleontological resources were identified during the scoping process (section 1.7).

3.11.2b Significance Criteria

Impacts to paleontological resources would be considered significant if fossils of scientific value are found and destroyed without documentation. Because the mineral resource is not protected, significant impacts would result only if fossils of scientific value are found in the overburden, either during mining or surface disturbance.

3.11.2c Impacts–Proposed Action (Preferred Alternative)

There are no known scientifically significant paleontological resources in the USACE East Lynn Lake Project. The potential for significant impact is considered to be low.

If oil and gas drilling, operations and maintenance described in the attachment to the RFDS (appendix B) were to occur, there would be a potential for impacts to paleontological resources.

3.11.2d Impacts–No Action

If the No Action Alternative is implemented, the federal coal would not be mined, and no significant impacts would be expected.

If oil and gas drilling, operations and maintenance described in the attachment to the RFDS (appendix B) were to occur, there would be a potential for impacts to paleontological resources.

3.11.2e Mitigation Measures

No mitigation is required for paleontological resources as no significant impacts to paleontological resources are expected to occur as a result of the Proposed Action.

3.11.2f Residual Impacts

No residual impacts are expected to occur.

3.11.2g Monitoring Recommendations

No mitigation is required for paleontological resources as no significant impacts to paleontological resources are expected to occur as a result of the Proposed Action.

3.12 RECREATION RESOURCES

The BLM uses the water recreation opportunity spectrum (WROS) as described in the *Water Recreation Opportunity Spectrum Users' Guidebook* (Aukerman and others 2004) to classify and evaluate recreation opportunities. However, the WROS uses the local management plan for its analyses and BLM has no management plans specific to West Virginia. Similarly, the USACE has no guidance documents pertaining to assessment of recreation opportunities (Smith 2007a). However, the USFS, which also manages land in West Virginia, uses a nationally recognized classification system used to describe different recreation settings, opportunities, and experiences and to help guide management activities. The *Forest Service Recreation Opportunity Spectrum* (ROS) by Clark and Stankey (1979) is used to assess recreation opportunities for the East Lynn Lake Coal Lease LUA/EIS. The ROS distinguishes the following two broad categories of recreation opportunities (Clark and Stankey 1979):

- **Developed recreation opportunities**–areas with constructed facilities providing public amenities and conveniences
- **Dispersed recreation opportunities**–primitive settings where there is little evidence of other people, isolation, challenge, and risk

In addition to defining the above recreation categories, the 1982 ROS also provides a framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities (USFS 1982). Six levels of recreation experience defined in the ROS are shown in table 3.12-1.

Table 3.12-1
ROS Recreation Levels of Experience

Primitive	Largely unmodified tracts of land of 5,000 acres or larger Evidence of human activity is not noticeable to the casual observer At least three miles from roads or motorized trails
Semi-primitive non-motorized	Predominantly natural environment with minimum evidence of human activity High probability of isolation from sights and sounds of humans Motorized use is prohibited
Semi-primitive motorized	Predominantly natural environment with some evidence of human activity Concentration of users is low Motorized use is allowed
Roaded Natural	Predominantly natural appearing environment with moderate evidence of human activity Moderate probability of experiencing affiliation with others Motorized use is allowed
Rural	Substantially modified natural environment Probability of experiencing affiliation with others is prevalent, as is the convenience of sites and opportunities Motorized use is allowed
Urban	Substantially developed environment dominated by man-made structures; sights and sounds of humans predominate Probability of experiencing others is prevalent, as is a higher level of convenience of sites and opportunities than in Rural ROS experiences Motorized use is provided for

3.12.1 Affected Environment

The recreation study area (figure 3.12-1) is the USACE East Lynn Lake Project, which encompasses the proposed lease tracts, the WVDNR East Lynn Lake WMA, and other USACE lands. The USACE East Lynn Lake Project is located within easy driving distance of the following metropolitan areas (USACE 2007b):

- Charleston, West Virginia (80 miles)
- Lexington, Kentucky (158 miles)
- Columbus, Ohio (163 miles)
- Louisville, Kentucky (228 miles)
- Cincinnati, Ohio (243 miles)

Interstate highway I-64 provides Interstate access to southwestern West Virginia (figure 1.1-1). U.S. Highway 52 and State Route 10 provide regional access while State Routes 37 and 152 provide local access to the USACE East Lynn Lake Project.

The USACE East Lynn Lake Project lands have abundant developed and dispersed recreational opportunities (USACE 2007b), listed below in table 3.12-2.

Table 3.12-2
East Lynn Lake Recreational Opportunities

Developed Opportunities	Dispersed Opportunities
Picnicking	Hunting
Children's recreation	Wildlife observation
Boating	Hiking
Fishing	Sightseeing
Water skiing	Bicycling
Swimming	Horseback riding
Camping	ORV use

The recreation opportunities listed above in table 3.12-2 meet the criteria for the *rural* and *roaded natural* ROS experience characterization; however, some recreation experiences such as hunting and wildlife observation fit the *semi-primitive motorized* and *semi-primitive non-motorized* characterization.

Available recreation facilities are listed in table 3.12-3 and shown on figure 3.12-1.

Table 3.12-3
East Lynn Lake Recreational Facilities[1]

Site Location Name	Recreation Opportunities
Below Dam Area	picnic shelters, picnic tables, restrooms, handicap access, playground, and hiking
Overlook Area	environmental interpretive center, picnic shelters, picnic tables, restrooms, handicap access, playground, hiking, and photo opportunities
Lake Office	restrooms, ranger office, and photo opportunities
Lakeside Area	marina (provides fuel, fishing equipment, bait, boat rentals, and a snack bar), concrete boat ramp and 180 slips, concession area, picnic tables, restrooms, hiking, and telephones
Lick Creek Area	boat ramp, restroom, picnic tables, playground, picnic shelters
Swimming Area	swimming beach and restrooms
East Fork Launch Ramp Area	boat ramp, restroom, and picnic tables
East Fork Campground	camping with restroom, showers, telephone, boat ramp, handicap access, playground, amphitheater, and hiking (169 sites)

[1] Source: USACE 2007b

The lake has a shoreline of approximately 46 miles at the summer pool elevation of 662 feet amsl, and covers 1,005 acres (USACE 1984). The lake averages 17 feet in depth, with a maximum of 50 feet (USACE 2006b). To increase the annual benefits for recreation, the elevation of the lake is maintained until November 1 when drawdown begins to provide capacity for flood control. Maintaining the lake level at a fairly constant elevation throughout the recreation season allows full utilization of boat ramps, marina, and swimming beaches (USACE 1984, 2006b).

Four launch ramps provide lake access for boating enthusiasts and fishermen. Fishing is allowed from boats and from the shoreline with the required West Virginia fishing license. Fish found in the lake include: largemouth, smallmouth, and striped bass; black crappie (*Pomoxis nigromaculatus*); red-breast sunfish (*Lepomis auritus*); walleye; channel catfish; and muskellunge. Channel catfish and muskellunge are stocked in the lake annually. Rainbow, brook, and brown trout are stocked in the East Lynn Lake dam tailwaters and Lick Creek Pond once per month every February, March, April and May (USACE 2007b).

Camping is available at the East Fork Campground and is open from early May to September. The campground has 169 campsites, most of which are available for reservations and have water and electric hook ups (USACE 2006b). Sites range in price from $16 to $28 per night.

The four hiking trails listed below are maintained within the USACE East Lynn Lake Project (USACE 2007b):

- Damsite Trail (1 mile roundtrip)
- Overlook Trail (4 miles roundtrip)
- Lakeside Trail (1 ½ miles)
- East Fork Trail (1 ½ miles)

Vehicle use is permitted only on designated roads (figure 3.12-1). An ORV is defined as any motorized recreational vehicle that is capable of being operated off an established road, and includes the following:

- 4 wheel-drive vehicle (pickup or sport utility vehicle)
- all-terrain vehicle (ATV)
- motorcycle
- rail buggy
- snowmobile

The use of ATVs and snowmobiles is prohibited except where specifically permitted by posted signs on designated roads and trails (figure 1.1-4). The USACE estimates that 75 percent of the backcountry use consists of ORV use (Smith 2007i).

The USACE East Lynn Lake Project's recreation season spans six months, beginning April 1 and extending through September. Recreational activities during this time period consist primarily of fishing. During the peak summer months (June, July, and August), family recreational vacations are the primary use. Visitation declines during September, when the major activities turn to fishing, hunting, and sight-seeing (USACE 1984). USACE East Lynn Lake Project visitation information is presented in table 3.12-4.

Table 3.12-4
East Lynn Lake Project Visitation

Total annual visitation (Smith 2007i)	
2006	531,157
2005	542,239
2004	467,876
2003	452,461
2003 Breakdown by area used (USACE 2006b)	
Backcountry	162,900
East Fork	153,554
Lakeside	48,702
Below Dam Area	39,052
Damsite	29,780
Lick Creek	18,473
Types of use (Davis 2007)	
Sightseeing	28%
Fishing	21%
Picnicking	14%
Swimming	14%
Boating	12%
Hunting	7%
Camping	3%
Waterskiing	1%

The WVDO's *West Virginia Statewide Comprehensive Outdoor Recreation Plan* (2003) has determined that tourism is a significant factor in the state's economic development. The plan anticipates hiking and biking trails as the number one recreational activity preference.

During the last five years most recreation uses at the USACE East Lynn Lake Project have remained steady. Two uses, camping and ORV use, have increased. The increased use of ORVs has caused extensive environmental damage, including increased erosion and damage to vegetation (USACE 2006a).

Recreation use is dependent on the weather: use increases when the weather is good (Smith 2007a). Given the current management situation, no changes in the condition of recreation resources are predicted, with the level of use for recreation uses staying steady, and levels of use for camping ORVs increasing at a fairly constant rate.

3.12.2 Environmental Consequences

3.12.2a Scoping Issues

The scoping issues for recreation identified during the scoping process (section 1.7) include:

- surface water quality that would impact recreational activities such as fishing, swimming, and boating,
- surface disturbance, and
- impacts to the development potential for future use.

3.12.2b Significance Criteria

Impacts to recreation resources would be considered significant if the Proposed Action would result in the following:

- conflicts with existing or known future land uses, or adopted land use plans, policies, or ordinances
- conflicts with planning efforts to protect the recreational resources of the project area
- incompatible adjacent land uses as defined by planning documentation

3.12.2c Impacts–Proposed Action (Preferred Alternative)

Potential impacts to recreation resources include:

- change in perception of area due to mining,
- potential for limited subsidence impact to surface recreation resources (road, water, lake, and streams),
- potential for limited subsidence impact to activities (fishing, swimming, boating, hunting),
- change in surface water quantity or quality used by recreation,
- impacts related to surface disturbance, and
- impacts to the development potential for future recreation.

Direct impact to recreation resources is dependent upon the extent of other surface impacts, including those listed above. Under the Proposed Action, a maximum of 20 acres of surface disturbance would occur over a 10-year period. Direct impact to recreation resources is expected to be minimal. Text in the section 3.1 (Geology and Minerals) addresses the impact of the Proposed Action to the dam stability and lake integrity and indicates no expected impact to these facilities; therefore, no direct impact to recreation facilities is expected to occur.

Reductions in recreation due to a negative perception of mining in the area are not expected to occur. Mining already occurs in the area, and the region. Many of the people using the lake for recreation are employed in the mining industry. Mining does not have a totally negative perception in the region, and in some cases is considered to have a positive impact (as in socioeconomics). Therefore, it is expected that this potential indirect impact would not occur.

The impacts associated with the issues identified during the scoping process are discussed below. The direct impacts to surface water quality identified in section 3.2 would indirectly impact recreational activities such as fishing, swimming, and boating. Under the RFDS, surface water quality is expected to be similar to the baseline conditions that currently exist. As described in sections 2.4 and 3.1, the surface disturbance due to the Proposed Action would be limited to a maximum of 20 acres over a 10-year period. No impacts to the development potential for future use related to recreation are expected.

As defined by the significance criteria, none of the impacts to recreation resources identified for the Proposed Action would result in a significant impact when evaluated against the baseline.

3.12.2d Impacts–No Action

No significant impacts to recreation resources are expected as a result of implementation of the No Action Alternative.

3.12.2e Mitigation Measures

No mitigation is required for recreation resources as no significant impacts to recreation resources are expected to occur as a result of the Proposed Action.

3.12.2f Residual Impacts

No significant impacts to recreation resources are expected to occur; therefore, no residual effects are expected to occur.

3.12.2g Monitoring Recommendations

No monitoring is recommended for recreation resources, as no significant impacts are expected.

3.13 AIR RESOURCES

3.13.1 Affected Environment

3.13.1a Air Quality

The air quality study area is the proposed lease tracts (figure 1.1-1). The proposed lease tracts are situated in southeastern Wayne County, within the Huntington, WV-Ashland, KY Air Quality Control Region (AQCR). Wayne County is currently classified as an "attainment" area for the following regulated criteria pollutants: ozone (O_3), particulate matter with aerodynamic diameters less than or equal to 10 microns (PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO) and lead (Pb). Wayne County is currently classified as a "nonattainment" area for particulate matter with aerodynamic diameters less than or equal to 2.5 microns ($PM_{2.5}$). A review of air quality data reported by the USEPA (USEPA 2006) from monitoring stations in Wayne or nearby counties from the period of 2004 to 2006 indicates that all criteria pollutants are well below the USEPA ambient air quality standards (AAQS), except for $PM_{2.5}$ and O_3. Wayne County was reclassified as an "attainment area" for ozone in October

2006 and the area's highest measured 8-hour average O_3 concentrations have been in marginal compliance with the 8-hour average AAQS of 0.08 parts per million (ppm).

The majority of air emission sources in Wayne County are in the northwestern part of the county, near Huntington and the Ohio River (*see* table 3.13-1, and figure 3.13-1). The USEPA has developed information regarding air pollution trends (USEPA 2007f) for multiple pollutants.

Trends for the Huntington, WV-Ashland, KY AQCR are presented on diagrams (a) through (f) on figure 3.13-2. The annual average SO_2 concentration, presented on diagram (a) , has been steadily decreasing from the period 1990 to 2006, while similar data for NO_2, as presented on diagram (b) is not complete enough to determine a trend. Diagram (c) on figure 3.13-2 shows that the second highest 24-hour PM_{10} concentrations have gradually decreased from 1993 through 1998, while annual average fine particulate matter (PM with aerodynamic diameters 2.5 microns or less) concentrations, shown on diagram (d) (figure 3.13-2) are generally decreasing throughout the period 1990 to 2006. Diagram (e) on figure 3.13-2 shows that CO concentration data are not complete enough to indicate a trend. Diagram (f) on figure 3.13-2 indicates that the measured fourth highest 8-hour O_3 concentration per year has slightly decreased over the period 1990 to 2006.

Several emission sources of criteria air pollutants are located within 10 miles of the proposed lease tracts (USEPA 2007k). These sources include the Rockspring coal preparation plant, the Wayne Compression Station, and the Argus coal preparation plant (USEPA 2007k). Based on a review of the USEPA AirData Web site (USEPA 1999), other emission sources of criteria air pollutants in Wayne County include the Aristech Chemical Corporation, Marathon Ashland Petroleum LLC, Columbia Gas Company, and Beech Fork Compressor Station.

Minimal information is available regarding air emissions for existing coal mine operations in Wayne County, other than emissions information for the two Applicants' coal preparation plants (Barton 2007e and Maggard 2007i). The majority of existing mining activities are conducted underground, and air emissions reaching the ambient air areas at the surface are considered to be minimal. A recent study (World Bank Group 1998) indicated that the amount of surface dust generated from an underground coal mine is approximately 0.01 tons of dust per 1,000 tons of coal produced. Consequently, existing activities result in minimal to no impacts to air resources.

Future air quality is expected to improve in the area for a number of air pollutants due to the effects of on-going USEPA programs to further reduce emissions of SO_2, NO_x, and PM_{10} from a number of major facilities. The *Clean Air Interstate Rule* (40 CFR 51, Subpart G) requires electrical generating units (EGUs) to reduce emissions of SO_2 and NO_x, although EPA is currently revising the Rule subject to Court Order. The application of best available retrofit technology (BART) under the *Regional Haze Rule* (40 CFR 51, Subpart P) will require further emission reductions of visibility impairing pollutants (such as SO_2, NO_x, and PM_{10}) to improve existing visibility levels at 156 national parks and wilderness areas throughout the country. Both regulations will reduce existing levels of SO_2, NO_x, PM_{10} and O_3 in the Huntington, WV-Ashland, KY AQCR area.

3.13.1b Global Climate Change

On-going scientific research has identified the potential impacts of so-called "greenhouse gas" (GHG) emissions [including carbon dioxide (CO_2), methane; nitrous oxide; water vapor; and several trace gasses] on global climate. Through complex interactions on a regional and global scale, these GHG emissions cause a net warming effect of the atmosphere (making surface temperatures suitable for life on Earth), primarily by decreasing the amount of heat energy radiated by the Earth back into space. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), recent industrialization and burning of fossil carbon sources have caused CO_2 concentrations to increase dramatically, and are likely to contribute to overall climatic changes, typically referred to as global warming. Increasing CO_2 concentrations also lead to preferential fertilization and growth of specific plant species.

Global mean surface temperatures have increased nearly 1.0 degrees centigrade (°C) [(equal to 1.8 degrees Fahrenheit (°F)] from 1890 to 2006 (Goddard Institute for Space Studies, 2007). However, observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Figure 3.13-3 demonstrates that northern latitudes (above 24 degrees north latitude) have exhibited temperature increases of nearly 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (1.8°F) increase since 1970 alone. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHG are likely to accelerate the rate of climate change.

In 2001, the Intergovernmental Panel on Climate Change (IPCC) indicated that by the year 2100, global average surface temperatures would increase 1.4 to 5.8°C (2.5 to 10.4°F) above 1990 levels (IPCC 2007). The National Academy of Sciences (2006) has confirmed these findings, but also indicated that there are uncertainties regarding how climate change may affect different regions. Computer model predictions indicate that increases in temperature will not be equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures is more likely than increases in daily maximum temperatures.

Several activities occur within the study area that may generate GHG emissions. Coal combustion, commercial and residential heating, transportation, large fires, and other combustion engines, can potentially generate CO_2 and some methane.

3.13.2 Environmental Consequences

3.13.2a Scoping Issues

No issues related to air resources were identified during scoping.

3.13.2b Significance Criteria

Significant impact levels for air pollutant emissions associated with the proposed project are the applicable state and national ambient air quality standards (NAAQS) and PSD Class II increments.

3.13.2c Impacts–Proposed Action

If the Proposed Action is selected and the RFDS is implemented, then existing mining operations and any associated air emissions would continue for an additional 10 to 15 years. Current emission levels are minimal and do not exceed the significance criteria. Therefore, no significant impacts to air resources are expected under the Proposed Action.

3.13.2d Impacts–No Action

If the No Action Alternative is selected and the NAS is implemented, existing operations would close about 10 to 15 years sooner than under the Proposed Action and RFDS. Air quality in the immediate vicinity of the existing mining operations would likely improve slightly at that time due to the reduction of existing unpaved road traffic. The unpaved road traffic emissions would not impact air quality away from the site of the release.

3.13.2e Mitigation Measures

No significant impacts to air resources are expected. Therefore, no mitigation measures are required.

3.13.2f Residual Impacts

No significant impacts to air resources are expected. Therefore, no residual impacts are expected.

3.13.2g Monitoring Recommendations

No significant impacts to air resources are expected. Therefore, no monitoring recommendations are provided.

3.14 NOISE

3.14.1 Affected Environment

The noise study area is the proposed lease tracts. In the early 1970s, the USEPA established numerical noise standards, which are summarized in their 1974 report *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare, with an Adequate Margin of Safety* (USEPA 1974). In developing these standards, both of which are reported as equivalent sound pressure level (L_{eq}), the USEPA drew on a large body of survey data describing the degree of activity interference and resulting annoyance for a variety of noise levels. However, these standards were promulgated in the *Noise Control Act of 1972* without regard to economic or technical feasibility and were often misconstrued and not realistic goals for short-term noise control. The budgetary funding for the enforcement of the *Noise Control Act of 1972* and its numerical standards were subsequently eliminated in the 1980s and the USEPA closed its Office of Noise and Radiation. While these standards are no longer enforced, they serve as generally accepted guidelines for environmental noise levels. Sound measurements on the proposed lease tracts are compared to the USEPA values for recreational areas, farm land, and general unpopulated areas: a value of 70 A-weighted decibels (dBA) over a 24-hour time period.

No noise level studies for the vicinity of the proposed lease tracts are readily available. Noise levels in the vicinity were measured during a site visit on March 29, 2007 (table 3.14-1 and figure 3.14-1). Measurements were collected at five locations (two outside the USACE East Lynn Lake Project boundary and at three locations within the USACE East Lynn Lake Project boundary). A Type 1 integrating sound level meter was used in accordance with ANSI S12.9 Part 3 measurement standards (ANSI 1983). The noise monitoring data were recorded and stored in the meter under the sample identification numbers "STOR1" through "STOR7." The first and last samples collected ("STOR1" and "STOR7") were pre- and post-calibration measurements to insure the accuracy of the data collected. These two samples are not associated with a location and are not shown on any figure.

Noise levels measured in the vicinity of the proposed lease tracts ranged from 41 dBA within the USACE East Lynn Lake Project to 65 dBA in the town of Wayne. The noise level measured at the Rockspring Ben Haley Branch mine portal guard shack was 63 dBA, which was influenced by the noise from a surface ventilation fan. The existing low noise levels recorded in the vicinity of the proposed lease tracts are typical of areas that are predominately rural and forested with light agricultural lands. These levels are much lower than the USEPA guidelines of 70 dBA for recreational areas, farmland, and general unpopulated areas and would not be construed as "excessive, unnecessary or unusually loud noise" per West Virginia noise standards.

While minimal historical noise level data are available, existing noise levels on the lease tracts most likely have not increased to levels that would be of concern. This general conclusion is supported by the low levels–less than 50 dBA–currently measured in the vicinity of the proposed lease tracts. Again, these levels are much lower than acceptable values for rural and generally undeveloped lands.

3.14.2 Environmental Consequences

3.14.2a Scoping Issues

No issues related to noise were identified during scoping.

3.14.2b Significance Criteria

The significance criteria used to assess potential impacts resulting from the RFDS or the NAS are the USEPA guidelines of 70 dBA for recreational areas, farm land, and general unpopulated areas (USEPA 1974).

3.14.2c Impacts–Proposed Action (Preferred Alternative)

If the Proposed Action is selected and the RFDS is implemented, the existing, adjacent underground mining operations would extend their facilities under the proposed lease tracts. Proposed surface activities would be temporary in nature. No new noise sources would be created. Any noise impacts associated with the existing underground operations would remain close to what they currently are. No significant noise impacts are expected.

3.14.2d Impacts–No Action

If the No Action Alternative is selected and the NAS is implemented, the current management situation–minimal surface activities on the USACE East Lynn Lake Project–would continue. No changes in noise levels are expected.

3.14.2e Mitigation Measures

No significant noise impacts are expected. Therefore, no mitigation measures are required.

3.14.2f Residual Impacts

No significant noise impacts are expected. Therefore, no residual impacts are expected.

3.14.2g Monitoring Recommendations

No significant noise impacts are expected. Therefore, no monitoring recommendations are provided.

3.15 VISUAL RESOURCES

When managing BLM-administered resources, the BLM is required to consider visual resources and scenic value through a broad range of regulations and planning guidance. However, the proposed lease tracts are located within the USACE East Lynn Lake Project. While the BLM manages the coal that lies under the USACE East Lynn Lake Project, the USACE manages the surface of those lands. As a result, the BLM's visual resource management system (VRMS) has not been applied to the USACE East Lynn Lake Project (BLM 2003), and does not apply to the proposed lease tracts.

The USACE uses a visual resources assessment procedure (VRAP), which was developed to provide USACE personnel with a systematic procedure for incorporating aesthetic considerations into USACE activities (Smardon and others 1988). However, this VRAP process has not been applied to the management of the USACE East Lynn Lake Project area.

The primary indicator used to describe existing visual resources for this FLUA/FEIS is the key observation point (KOP). A KOP is a location where an observer can see an area that would potentially be impacted by a proposed activity.

3.15.1 Affected Environment

The proposed lease tracts lie next to both the northern and southern sides of the lake, and the visual source study area is considered to be the viewshed of the USACE East Lynn Lake Project. The USACE East Lynn Lake Project is situated in a rural, mountainous area, with narrow winding ridges and V-shaped valleys. Historically, timber was harvested from the land or cleared for agricultural use. Today, lands within the USACE East Lynn Lake Project support maturing forests. The East Lynn Lake Project, including the lake and the surrounding land, are considered to have moderate to high scenic quality and public value. Visitors and observers in the area value the land for its natural and scenic qualities.

The USACE has not designated KOPs for use in management of the USACE East Lynn Lake Project. For the purposes of this FLUA/FEIS, typical observers of the USACE East Lynn Lake Project include:

- USACE staff that work at the various facilities, or
- visitors that come to enjoy the recreational activities of camping, fishing, boating, hunting, and ORV use that could see the proposed lease tracts in the foreground, middle ground, or background of their view.

The KOPs could be located along roads or at campgrounds, recreation areas, boat launch ramps, the overlook, or any other high point with a clear view of the proposed lease tracts. Photographs included in appendix C (photographs C-2, C-4, C-6, C-10, and C-12) provide representative views from possible KOPs.

Looking out across the USACE East Lynn Lake Project from a high point, an observer can see:

- the lake
- the dam
- USACE recreational facilities
- the forested hills
- several family cemeteries
- a USACE-owned radio tower located south of the USACE East Lynn Lake Project office, and
- State Route 37, which provides primary access to the USACE East Lynn Lake Project.

From the lake surface, an observer could view the top of the radio tower, but the structure is not obtrusive (Smith 2007c).

Under the existing management situation at the USACE East Lynn Lake Project, trends related to forest cover indicate that as the existing forest matures greater canopy will develop, creating a more dense forest cover. This process is referred to as succession. As the succession of the forest species continues, volunteer trees will become established on disturbed land and develop into mature stands. As succession occurs, the number of permanent openings or clearings in the viewshed will decrease.

Trends related to recreational use indicate that the viewshed as experienced by the observer will likely remain unchanged over time, but the number of visitors likely will increase. If recreational activities such as mountain biking or the use of ORVs were to increase, then impacts from those activities may become more visible and may affect an observer's perception. This impact would be relatively less significant or insignificant for single-track activities such as mountain biking, or motorcycling, than it would be for ORVs such as ATVs and sport utility vehicles. However, no change in the level of use or type of user is expected. No significant visual impacts to surface lands, streams, or waterways are expected to occur.

Trends related to utility maintenance or repair, and to oil and natural gas exploration and development indicate that continued limited, minor impacts to visual resources will occur. If a new utility ROW were cleared, minor to major impacts to visual resources would occur. Two applications to install new oil and gas wells on Rockspring proposed lease tract F have been approved. If the number of oil and natural gas wells and/or associated facilities including access roads and collection pipelines were to increase, minor

to major impacts to visual resources would occur. The extent of this impact would depend on the type of activity and the location relative to KOPs.

3.15.2 Environmental Consequences

3.15.2a Scoping Issues

One issue related to visual resources that was raised during scoping was the potential impact to aesthetic value of the local viewshed as a result of the proposed mining.

3.15.2b Significance Criteria

The criteria used to determine significance of impacts to visual resources was any change to the viewshed as a result of the proposed mining.

3.15.2c Impacts–Proposed Action (Preferred Alternative)

Under the Proposed Action and associated RFDS, minimal to no subsidence is expected, and no significant impacts to water resources, vegetation or soils are expected. Therefore, the forest covering the proposed lease tracts should not be affected. A maximum of 20 acres of surface disturbance, distributed over roughly 13,000 acres over a 10-year period, would occur. This surface disturbance would involve minimal impact to the forest canopy, and would not likely be visible in the viewshed. If a ventilation shaft or rescue shaft were to be constructed on the surface of the proposed lease tracts, the height of the structure would not exceed the height of the forest canopy, and would not be visible in the viewshed. Consequently, no significant impacts to visual resources are expected as a result of the proposed mining.

As the existing forest matures, greater canopy will develop, creating more dense forest cover. The number of permanent openings or clearings in the viewshed will decrease. The number of visitors to the USACE East Lynn Lake Project will likely increase. If recreational activities such as the use of ORVs were to increase, then impacts from those activities may become more visible and may affect an observer's perception. However, no change in the level of use or type of user is expected. No significant visual impacts to surface lands, streams, or waterways are expected to occur.

3.15.2d Impacts–No Action

Under the No Action Alternative, the existing management situation would continue. As the existing forest matures, greater canopy will develop, creating more dense forest cover. The number of permanent openings or clearings in the viewshed will decrease. The number of visitors to the USACE East Lynn Lake Project will likely increase. If recreational activities such as mountain biking or the use of ORVs were to increase, then impacts from those activities may become more visible and may affect an observer's perception. The attachment to the RFDS indicates a potential increase in roads to access drill sites, operate wells, and maintain the wells and collection pipelines. This increase in access would likely cause an increase in all types of ORVs and illegal timber harvest. This increase could cause a significant visual impact if not controlled.

3.15.2e Mitigation Measures

No significant impacts to visual resources are expected under the Proposed Action or associated RFDS. As a result, no mitigation measures are required.

3.15.2f Residual Impacts

No significant impacts to visual resources are expected under the Proposed Action or associated RFDS. Consequently, no residual impacts are expected.

3.15.2g Monitoring Recommendations

No significant impacts to visual resources are expected under the Proposed Action or associated RFDS. As a result, no monitoring recommendations are provided.

3.16 HAZARDOUS MATERIALS AND SOLID WASTE

3.16.1 Affected Environment

The study area for hazardous materials and waste is the area within the proposed lease tracts. The affected environment includes the water, soil, vegetation, fish and wildlife, and air resources that could be impacted by a spill or accidental release of hazardous materials, petroleum products, or waste.
A description of the applicable laws and regulations regarding hazardous material reporting is presented in appendix H.

3.16.1a Hazardous Materials

The USACE has not stored hazardous materials on site since the USACE East Lynn Lake Project was constructed. Vehicles are serviced off-site or are serviced by a vendor that comes onto the site. The USACE does not maintain any equipment on site that can hold large quantities of hazardous materials or petroleum products (Smith 2007l).

Activities that have occurred or do occur within the study area and could involve hazardous materials or oil include:

- legal and illegal ORV use,
- construction, operation, maintenance, and decommissioning of oil and gas development and transmission facilities (including well drill pad, road, pipeline, compressor station and other facilities), and
- illegal logging.

3.16.1b Legal and Illegal ORV Use

Legal and illegal ORV use occurs on the proposed lease tracts. According to Wayne County Emergency Services personnel, no significant spills or releases have been reported in the vicinity of the proposed lease tracts since 1999 (Willis 2007b). Quantities of hazardous materials associated with ORV use are

typically below the reporting quantities, and the potential for hazardous materials release or oil spills from these activities is expected to be low.

3.16.1c Oil and Gas Development

Oil and gas companies have been operating development and collection facilities on the proposed lease tracts since at least the 1960s. According to USACE personnel, one spill associated with oil and gas development has occurred on the proposed lease tracts. In the 1980s, a fuel truck supplying an oil and gas facility overturned as it crossed over a creek bed. The USACE Project personnel responded to the spill and a contractor cleaned up the spill. Over the past two decades, state oversight of oil and gas development activities has increased, and housekeeping at oil and gas facilities has improved (Smith 2007a and Smith 2007l).

Current and future oil and gas facility operators must comply with appropriate state and federal permits and requirements, and must maintain spill prevention, control, and countermeasure plans to minimize release of materials to the environment (Gocke 2007). Gasoline, diesel fuel, oils, greases, anti-freeze, solvents, and other chemicals that may be hazardous materials may be stored at these facilities, or may be used on-site during maintenance of equipment at these facilities.

3.16.1d Illegal Logging

Small-scale illegal logging has occurred occasionally on the proposed lease tracts. Quantities of hazardous materials associated with small-scale logging are typically below the reporting quantities, and the occurrence of hazardous materials release or oil spills is expected to be low.

3.16.1e Solid Waste

Solid waste produced at the USACE East Lynn Lake Project is removed by Allied Waste and disposed of at a permitted solid waste landfill (Smith 2007l). Any solid waste produced at the oil and gas facilities must be removed from the facilities and disposed of in permitted solid waste facilities, in accordance with appropriate federal and state regulations.

Numerous public restroom facilities are maintained at the USACE East Lynn Lake Project. Domestic waste from these restrooms is treated in one of two on-site water treatment plants. No domestic waste is produced at the existing oil and gas facilities.

3.16.1f Summary

Legal and illegal ORV use, oil and gas development, and illegal small-scale logging occur on the proposed lease tracts. Solid waste is disposed of in permitted waste facilities. Domestic waste is treated on-site. All of these activities likely will continue in the future.

3.16.2 Environmental Consequences

3.16.2a Scoping Issues

During the scoping process, one issue that was identified is the location of coal refuse storage facilities. Under the Proposed Action, waste from the proposed mining would be disposed of in existing, permitted coal refuse piles and slurry impoundments that exist on private lands situated within the East Fork of Twelvepole Creek watershed, upgradient of the lake and/or within the Right Fork of Laurel Creek subwatershed. Evaluation of this issue is outside the scope of this environmental analysis.

3.16.2b Significance Criteria

Under the Proposed Action or No Action Alternative, a release of hazardous material(s) within the proposed underground mining facilities or on the surface of the proposed lease tracts in a quantity equal to or greater than the Superfund reportable quantity (RQ), described in appendix H, would be considered significant. An oil spill to navigable waters or adjoining shorelines, or an oil spill that could violate water quality standards, or that could cause a film, sheen, or discoloration, or that could cause a sludge or emulsion would be considered significant.

3.16.2c Impacts–Proposed Action (Preferred Alternative)

3.16.2c1 Proposed Underground Mining

If the Proposed Action is selected and proposed mining is implemented, underground room-and-pillar mining would be performed. No surface mining is proposed under the RFDS. Chemicals present in the proposed underground mines would include:

- powdered lime, known as rock dust, which is used to suppress explosive atmospheric conditions,
- chemicals in self-contained breathing apparatus and rescue chambers,
- resinous glues associated with rock bolting, and
- silica sand used to provide traction for the continuous mining machines.

In addition, petroleum products including diesel fuel, hydraulic fluid and lubricants would be used to operate and maintain the underground mining equipment. These materials would not be stored in the mines. Instead, these materials would either be delivered, on an “as needed” or “just in time” basis, to the mine portals, which are located on private lands, or stored in warehouses or storage sheds near the mine portals. These materials would be transported into the mine by conveyor (*see* photograph C-9 of conveyor in appendix C), used, then returned to the portal. These materials are typically transported into underground mines in containers that hold a maximum of 5 gallons (Maggard 2007j; Barton 2007f) which is considered to be a relatively small quantity for the types of materials being used in the mines. The petroleum products used to maintain the equipment would sometimes be transported by the pallet. These materials would be used fairly quickly during the mining process. Waste oil would be stored within secondary containment. Best management practices and permit requirements, including chemical handling requirements, would be followed during mining. During operations a spill contingency plan

would be maintained and followed. A minimum of six federal land and mineral administration and state permitting agency officials –WVDEP (including WVDMR), WVDNR, USACE, OSM, and USEPA– may inspect the mine, and observe monitoring results. Therefore, it is expected that the spill contingency plan and other water quality requirements would be enacted and followed.

If a release of hazardous material(s) or an oil spill were to occur in the proposed underground mining facilities, potential impacts to groundwater resources could occur. However, because the potential volume or quantity of material spilled is expected to be less than the RQ, direct or indirect impacts to groundwater resources would be localized and minimal. Furthermore, the spill contingency plan would be implemented immediately, in accordance with best management practices and permit requirements, and any potential impacts would be minimized. Implementation of these preventive measures would minimize the potential for direct or indirect impacts to groundwater resources.

During exploration drilling or ventilation shaft installation on the proposed lease tracts, it is assumed that activities would be performed in accordance with state and federal regulations, and that best management practices would be followed. Spill contingency plans would be developed and implemented immediately, and any potential impacts would be minimized.

During emergency rescue activities on the surface of the proposed lease tracts, spills or accidental releases could occur. The quantities of hazardous materials likely to be in use during such activities would be less than the RQ. Therefore, it is expected that direct or indirect impacts to surface water, groundwater, soil, vegetation, or wildlife would be localized and minimal.

If the Proposed Action is selected and the RFDS is implemented, federal coal would be transported by conveyor (*see* photograph C-9 of conveyor in appendix C) to existing permitted preparation plants, located on private land. Coal would be shipped by rail or truck to end users. Coal refuse would be transported from the preparation plants to permitted coal refuse storage facilities located on private land, in accordance with WVDMR requirements. Known facilities in the vicinity of the nine proposed lease tracts have capacity to safely and effectively accommodate and contain the additional waste from the federal coal, and will continue to operate at the same production rates and volumes regardless of the outcome of this LUA/EIS process. These facilities operate under WVDMR permits that require water quality protection and erosion and sediment control protection plans, and the likelihood of a spill or accidental release is low. On-going solid waste handling practices would continue. No significant impacts are expected under the Proposed Action.

3.16.2c2 Activities on the USACE East Lynn Lake Project

On the surface of the proposed lease tracts, the USACE would continue to operate the USACE East Lynn Lake Project recreation facilities, and the WVDNR would continue to operate the WMA. Legal and illegal ORV use and small-scale illegal logging occur on the proposed lease tracts. Quantities of hazardous materials and oils associated with these activities are typically low, and the potential for a hazardous materials release or oil spill from these activities is expected to be low.

3.16.2c3 Existing and Proposed Oil and Gas Development

Oil and gas companies would continue to operate and maintain oil and gas collection and transmission facilities on the proposed lease tracts. Current practices for hazardous material, oil, and solid waste

handling and emergency response would continue, in accordance with state and federal regulations. In the event of an oil spill or a natural gas release at one of the oil and gas collection facilities that exist on the proposed lease tracts, it is assumed that in accordance with best management practices and permit requirements, the spill contingency plan would be implemented immediately and any potential impacts would be minimized. Implementation of these preventive measures would minimize the potential for direct or indirect impacts to groundwater or surface water resources, soils, vegetation, or wildlife.

3.16.2d Impacts–No Action

Under the No Action Alternative, the frequency of hazardous material spills associated with on-going USACE East Lynn Lake Project maintenance activities, ORV use and small-scale illegal logging on the proposed lease tracts is expected to remain stable and infrequent. In the event of an oil spill or a natural gas release at one of the oil and gas collection facilities that exist on the proposed lease tracts, it is assumed that in accordance with best management practices and permit requirements, the spill contingency plan would be implemented immediately and any potential impacts would be minimized. Implementation of these preventive measures would minimize the potential for direct or indirect impacts to groundwater resources. On-going solid waste handling practices would continue. No significant impacts are expected under the No Action Alternative.

3.16.2e Mitigation Measures

No significant impacts associated with hazardous materials or waste are expected under the Proposed Action or No Action Alternative. Therefore, no mitigation measures are required for either alternative.

3.16.2f Residual Impacts

No residual impacts associated with hazardous materials or waste are expected.

3.16.2g Monitoring Recommendations

No residual impacts associated with hazardous materials or waste are expected under the Proposed Action or the No Action Alternative, and no monitoring recommendations are required for either alternative.

3.17 LAND TENURE, USE, AND ACCESS

3.17.1 Affected Environment

The development of the USACE East Lynn Lake Project was authorized by the *Flood Control Act of 1938*. Planning began in the early 1960s and was completed in 1964. Land acquisition, relocation of roads and utilities, building removal, clearing, and construction of the dam and reservoir were completed in 1969 (USACE 1974c). Photos representative of the USACE East Lynn Lake Project area are included in appendix C (C-1 through C-6, C-10 through C-12).

All surface and mineral estate rights for the proposed site of the USACE East Lynn Lake Project were privately owned prior to acquisition by the USACE. The USACE acquired the surface estate in the mid 1960s. In the 1970s the coal estate was acquired by condemnation through eminent domain. The

acquisition process was started in 1977 and the litigation was completed in 1991. The USACE acquired 15,883 acres of the coal estate for $57 million, including over $20 million in interest associated with the time required to complete the litigation.

However, local coal companies indicated interest in leasing the federal coal at East Lynn Lake. Eight years later, the *Water Resources Development Act of 1999* removed the consent authority as an SMA given under 43 CFR 3400.3, and the leasing authority remained with the BLM. The USACE retains management of the surface estate. The oil and gas estate remains in private ownership, therefore oil and gas development continues without triggering a NEPA process/review. In contrast, proposing to lease federal coal is a federal action which triggers a NEPA process/review, in this case an EIS, as identified by 43 CFR 3410.2-2, and a land use planning requirement, in this case a land use analysis, as identified in 43CFR 3420.1-4.

The USACE East Lynn Lake Project consists of a total of approximately 24,833 acres, originally allocated to the following uses (USACE 1984):

- 1,005 acres of surface water (flood control, fish, and wildlife)
- 888 acres used for project operations
- 49 acres for intensive recreation (camping, marina, etc.)
- 2,171 acres for low density recreation (trails, open area, etc.)
- 20,720 acres for wildlife and forestry

When the surface estate was acquired by the USACE, 22 cemeteries were excluded from the acquisition and left in private ownership, each one covering a few acres. Twelve of the 22 cemeteries are within the proposed lease tracts (Argus 2006a, USACE 2007b, Anslinger and others 2007, BLM 2009). The U.S. owns the coal under all but two of the private cemeteries, both of which are located off of the proposed lease tracts:

- The Taylor Wallace Cemetery (which is believed to be "Wallace Cemetery," located south of Argus tract B on figure 3.10-1)
- the Jarrett Maynard Cemetery

The oil and gas estate under all 22 cemeteries is privately owned. Within the USACE East Lynn Lake Project boundary there are at least 144 privately owned gas wells, most of which were installed in the 1950s to 1960s, before the USACE East Lynn Lake Project was constructed. The wells are accessed by a network of primitive roads and the gas is transported out of the area by a system of pipelines. Applications for several additional wells are pending and being processed by state and federal agencies. Under the attachment to the RFDS, 12 to 20 additional gas wells would be constructed on the proposed lease tracts in the next five years.

Numerous land use authorizations, referred to as outgrants, exist according to the USACE (Appendix I in USACE 2006a):

- 6 leases
- 35 easements, licenses, and consents

These outgrants authorize a marina, wells, pumping stations, gas pipelines, roads (including State Highway 37), bridges, power and telephone lines, water lines, a WVDNR building, sediment dam and pond, and conveyor. In addition, the WVDNR holds a license issued by the USACE for management of fish, wildlife, and forest resources covering 22,928 acres (USACE 2006a).

No authorized livestock grazing is allowed on the USACE-managed lands or on the WVDNR-managed lands. While both the USACE and WVDNR planning documents make extensive reference to forest management and forest product harvests, no forest products have been sold by either management agency. Forest product theft from the USACE East Lynn Lake Project lands has been a recurring problem.

Several developed recreation sites are open to the public and a fee is required (figure 1.1-4). The USACE East Lynn Lake Project is open to dispersed recreation use and no permit is required. The marina is a leased concession and provides boating services to the public, as described in section 3.12 (Recreation Resources).

3.17.2 Environmental Consequences

3.17.2a Scoping Issues

The following scoping issues were identified related to land tenure, use, and access:

- conflicts with existing and future uses (such as the USACE East Lynn Lake Project, oil and gas wells, cemeteries)
- potential for combustion due to the combination of underground mining and forest fires
- future mining actions which directly or indirectly result from the proposed underground mining

3.17.2b Significance Criteria

The following significance criteria have been identified for land tenure, use, and access:

- loss of 5 percent or more of other current or future uses such as access, timber harvest, utilities, gas production, or surface uses
- decrease of 10 percent or more of land or estate values due to the underground mining
- loss of 5 percent or more of existing access to other surface uses

3.17.2c Impacts–Proposed Action (Preferred Alternative)

The Proposed Action and the associated RFDS are expected to have minimal direct impact on other existing or future land tenure, land uses, or access, as noted below.

If the Proposed Action is selected, the lease would convey certain rights to the lessee temporarily, depending on the specific terms and conditions of the lease. A lease typically includes a diligent development clause requiring the lessee to proceed with development and mining within a reasonable time period. A lease would also require several forms of payment to the federal government, including holding fees, bonus bid payment, and production royalties. Production royalties are shared with the state

and described in other sections of this FLUA/FEIS. A lease has a minor impact on the estate value of the federal holdings.

In the case of the proposed East Lynn Lake coal lease, the lease and associated mining could have a minor effect on the value and use of the oil and gas estate due to the conflicts in use of both resources. These conflicts are also described in other sections of this FLUA/FEIS. The proposed leasing and mining would not affect other land or estate values within the proposed lease tract boundary. The extension of coal mining that would result from the proposed leasing could have a limited impact on land values in the area. For example, the negative perception of coal mining could depress nearby land values, or the positive economic effects could result in increased land values.

The potential surface impact on a maximum of 20 acres could impact current and future access to the USACE East Lynn Lake Project or adjacent lands if roads or trails were disturbed due to subsidence or temporary closure during the proposed potential surface uses associated with the proposed mining. These impacts would be temporary in nature.

If the Proposed Action is selected, land tenure would be affected by the proposed leasing by the conveyance of specific rights to the lessee during the period of the lease. This leasing to a private entity would require additional work and coordination on the part of the surface owners (USACE and cemetery owners), as well as the oil and gas estate owners. Granting of other rights for other uses (utilities, roads, recreation, communication, pipelines) by the surface owners would be affected to a very limited degree, requiring additional coordination and cooperation. The existing "outgrant" holders should not be directly affected because their uses would be protected by avoidance and/or protection as part of the proposed mine planning/permitting process.

The other existing uses, discussed in detail in other sections of this FLUA/FEIS include flood control, recreation, wildlife habitat, timber production/harvest, and easements. As previously stated, current and future surface land uses would not be directly affected except if the proposed potential 20 acres (maximum) of surface disturbance occurs. Any impacts to other land uses are expected to be very limited in both duration and acreage.

Based upon the information summarized above, the expected impacts to this resource are not considered significant.

3.17.2d Impacts–No Action

Under the No Action Alternative and the NAS, existing land tenure, use and access would continue in accordance with existing land use plans. Any activities associated with oil and gas well development would be performed in accordance with state and federal regulations. No significant impacts are expected.

3.17.2e Mitigation Measures

No significant impacts to land tenure, use, and access have been identified. Therefore, no mitigation measures are required.

3.17.2f Residual Impacts

Because no significant impacts to land tenure, use, and access are expected, no residual impacts are expected.

3.17.2g Monitoring Recommendations

Because no significant impacts to land tenure, use, and access are expected, no monitoring is recommended.

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CHAPTER 4
CUMULATIVE EFFECTS

4.0a METHODOLOGY

This section summarizes the cumulative impacts that are occurring as a result of existing development in the East Lynn Lake Project area and considers how those impacts would change if other projected development in the area occurs and if the East Lynn Lake LBA tracts are leased and mined. Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

Predicting resource conditions or impacts to those conditions loses value as one looks further and further into the future, as technological, political, and legal conditions can change dramatically. Consequently, the period of time used to assess impacts in this cumulative effects section is 20 to 30 years into the future, unless noted otherwise.

For each of the resources, the specialists clarified the geographic and temporal boundaries of the cumulative effects study area. The specialists then described the baseline condition for the resource and evaluated whether past degradation has brought the resource to a threshold beyond which further change in the resource condition would be detrimental. The specialists identified activities or projects, together referred to as "actions," that have occurred in the past, are currently occurring, or are proposed to take place in the reasonably foreseeable future. These actions were identified through interviews with federal, state, and local agency representatives, examination of the *Land Use Master Plan, Wayne County, West Virginia* (Wayne County 2004), and discussions with resource companies such as oil and gas companies and coal companies, energy companies, and utility companies. The following sections discuss the actions that were identified.

4.0b PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

4.0b1 Proposed Action (Preferred Alternative)

Under the *Reasonably Foreseeable Development Scenario* (RFDS; appendix B) associated with the Proposed Action, the successful bidder(s) would perform approximately 50 percent extraction room-and-pillar underground mining of federal coal under the proposed lease tracts. The successful bidder(s) would transport the coal by conveyor to existing, permitted coal processing facilities on private lands, and would store coal waste in existing, permitted coal refuse piles and slurry impoundments on private lands. These processing and waste storage facilities also receive coal mined from other properties within the cumulative effects study area. The lives of both the processing and storage facilities would be extended by 10 to 15 years. During that time, processing and waste transportation would continue at existing levels. The successful bidder(s) could perform exploratory drilling activities, mine rescue operations, and/or ventilation shaft installation on a maximum of 20 acres over a period of 10 years. These activities must comply with state and federal laws and regulations.

If impacts are identified during the leasing process that are not addressed by the existing required mitigation measures, the BLM can require additional mitigation measures, in the form of stipulations on the new lease, within the limits of its regulatory authority. Additionally, conditions may be added to the mine plan by OSM or to the permit itself by OSM or the State Regulatory authority during permitting an approval process.

On-going activities would continue over the next 20 to 30 years, including, oil and gas development , recreational activities, and naturally-occurring erosion.

4.0b2 No Action Alternative

Under the NAS associated with the No Action Alternative, the LBAs would be denied, and no coal leasing or mining would occur under the proposed lease tracts. On-going, non-action related activities would continue over the next 20 to 30 years, including oil and gas development, recreational activities, and naturally-occurring erosion. Mining on adjoining private lands will continue regardless of the outcome of this LUA/EIS process.

4.0b3 Other Coal Mining

Surface and underground coal mining have long occurred within the vicinity of the proposed lease tracts. Since the early 1800s, small-scale hand-dug coal mining, typically in the No. 5 Block seam, has occurred in the area. Large-scale commercial mining has been ongoing in the area since the 1970s. Abandoned commercial mines in the No. 5 Block seam are also located within the study area, north of the proposed lease tracts (figure 3.1-13).

While theoretically possible, high extraction underground mining has never been proposed or performed in the cumulative effects area (Kitchen 2009). Any change to the mining method proposal by the successful bidder for the proposed lease tracts would require a new NEPA analysis.

Current mining activities in the vicinity of the proposed lease tracts include surface and underground room-and-pillar mining of the Coalburg/Winifrede seam and the No. 5 Block seam, and operation of processing and storage facilities. As much as 4 to 5 million tons of clean recoverable coal is produced each year.

Rockspring will continue to operate its permitted Camp Creek and Ben Haley underground mines and associated refuse pile, slurry impoundment, and preparation plant. Rockspring expects to run out of storage capacity for waste from its existing facilities in the near future. To support on-going mining activities, Rockspring is proposing to construct an additional slurry impoundment and coal refuse pile within the Laurel Creek watershed. The footprint currently being proposed for this facility is about 184 acres. This facility would be necessary regardless of the outcome of this LUA/EIS process. The facility would be constructed using the same standards of practice used to construct and maintain existing facilities and would comply with state and federal regulations (Barton 2007g).

Argus will continue to operate its permitted underground and surface mines located southeast of the proposed lease tracts. Argus expects to run out of storage capacity for waste from its existing facilities in the near future. Argus plans to expand an existing coal refuse pile within the East Fork of Twelvepole Creek watershed, and is in the process of applying for the permit to expand the facility. These facilities

would be necessary regardless of the outcome of this LUA/EIS process. If the facilities are necessary, and permits are obtained, the facilities would be constructed using the same standards of practice used to construct and maintain existing facilities and would comply with state and federal regulations. If permitted, the proposed expansion would involve raising the final elevation of the pile, and would increase the total footprint of the pile by 20 to 30 acres (Maggard 2007k).

Surface and underground mining of additional private reserves primarily in the Coalburg/Winifrede seam, and possibly in the No. 5 Block seam, is likely to continue in the study area in the future, though mineable reserves in the area are becoming depleted. Mining companies likely would continue to use room-and-pillar mining with low-extraction ratio. However, if the demand for coal were to increase significantly, companies may propose to use longwall mining methods. Such mining methods are not proposed for the East Lynn Lake Property, and would require additional NEPA analyses if proposed.

Mining of federal coal reserves other than those addressed by this LUA/EIS is not considered to be a reasonably foreseeable future action. The USACE manages the lands that lie over the federal coal for flood control, recreation, and wildlife habitat. According to the USACE's *Real Estate Handbook* (ER 405-1-12), the procedure of the USACE in acquiring the necessary land or interests to accommodate projects is to permit the reservation of the minerals in the land, unless the reservation is adverse or hostile to the operation of the project (USACE 2005). Because it was determined necessary to acquire the coal in order to ensure realization of "optimum values for all [USACE East Lynn Lake Project] purposes," the USACE Huntington District has rejected proposals to perform surface or underground mining of the federal coal that lies under the USACE East Lynn Lake Project.

The BLM manages this federal coal, and would require any company interested in leasing and mining other federal coal within the USACE East Lynn Lake Project to follow a process similar to the one the Applicants have followed:

- submitting lease-by-applications,
- communicating with BLM,
- engaging in the NEPA process, and
- if the outcome of the NEPA process supports leasing of additional coal reserves, then securing the appropriate federal and state permits and approvals.

If surface access were obtained, the use of surface mining would be highly unlikely, given the cost of and opposition to surface mining. Underground access also may become infeasible over time, because mining on adjoining private lands may leave minimal to no feasible underground access to the federal coal.

4.0b4 Oil and Natural Gas Development

Oil and gas development activities can include construction of roads, drill pads, and wells, and installation of storage tanks, and pipelines. Development activities have occurred in the vicinity of the proposed lease tracts since before the 1930s. Over the next 20 to 30 years, oil and gas development will continue, and may increase. Due to increased access to the area via oil and gas development access roads, illegal timber harvest could also increase.

4.0b5 Construction and Maintenance of the USACE East Lynn Lake Project

In 1969 the USACE constructed the East Lynn Lake reservoir within the East Fork of Twelvepole Creek watershed, upstream of the confluence with Laurel Creek, and permanently inundated land within the footprint of the reservoir. The East Lynn Lake Project was formulated on the basis of an economic life of 100 years. The physical life of the project will likely be considerably in excess of that period of time. Major rehabilitation may be required upon expiration of the project life or at other times as needs change or as new development or management techniques evolve (USACE 1974b).

4.0b6 Recreational Activities

Historically, dispersed recreational activities including hunting, fishing, swimming, hiking, biking, and ORV use have occurred in the vicinity of the proposed lease tracts. After establishment of the USACE East Lynn Lake Project in 1969, organized recreational activities including boating, fishing, swimming, and ORV use have been offered at and near the lake. Illegal ORV use also occurs on and off the USACE East Lynn Lake Project. The types of recreational activities and the number of people engaging in recreational activities in the area is likely to continue to increase in the future, especially as the regional economy shifts toward an economy based on services and tourism.

4.0b7 Logging

Logging has occurred within the cumulative effects study area for more than a century. Commercial logging likely will continue to occur at least for the next 20 to 30 years. Though the USACE has not exercised its license, timber harvest is legal within the proposed lease tracts. The USACE may decide to exercise its right to harvest the merchantable timber sometime in the future. Small-scale illegal logging has occurred on the proposed lease tracts. The current level of illegal harvest is not well documented, and therefore, it is not possible to quantify the extent that it may increase with increased access. Increased access to the area on added oil and gas development access roads could lead to increased illegal timber harvest.

4.0b8 Construction and Maintenance of Power Transmission and Distribution Lines

Regional power companies including Appalachian Electric Power have constructed power transmission and distribution lines within approximately 40-ft wide rights-of-way in the vicinity of the proposed lease tracts. The company may construct additional distribution lines in the reasonably foreseeable future.

4.0b9 Construction and Maintenance of Water Lines

The town of Wayne installed a water line along the western and southern side of Route 37 to a point near the dam (Willis 2007a). In the *Land Use Master Plan, Wayne County, West Virginia* (Wayne County 2004), Wayne County proposes to extend the existing water line farther to the east along Route 37 to the Wayne County-Wilson County line.

4.0b10 Construction and Maintenance of Telephone Lines

Regional telephone companies have constructed telephone lines that serve users in the vicinity of the proposed lease tracts. Frontier maintains a main trunk line that follows Route 37, and a line that extends

into Bartram Branch. Frontier also maintains a remote switch near Dry Branch, north of the lake (Davis, Jerry 2007).

4.0b11 Construction and Maintenance of Communication Towers

Several radio and cellular telephone towers have been constructed and are maintained in the vicinity of the proposed lease tracts. Construction of additional towers is highly likely.

4.0b12 Regional Infrastructure

The State Appalachian Development Plan (WVDO 2005) coordinates planning for the ARC and the West Virginia Governor's office through six regional planning districts. Projects are ranked and added to the Consolidated Project Priority List. Wayne County has fifteen projects on this list, including ten water projects, three sewer projects, and three projects related to recreational facilities/tourism. These projects, listed in table 4.1-1, are dispersed throughout the county.

Table 4.1-1
Wayne County Projects
WVDO 2004-2005
Consolidated Project Priority List
and TOLSIA Highway Project

Rank	Project Name	Project Type	Cost
14	Beech Fork State Park Lodge	Building	$15,000,000
28	Laurel Creek Emergency Water	Emergency	$275,000
108	Wayne County Bike Path	Recreation	
113	City of Kenova Welcome/Tourist Center	Tourism	
99	Town of Wayne Sewer Improvements	Other	
24	Dock Creek Pump Station and Sewer Extension	Sewer	$2,036,000
27	Town of Fort Gay Water/Wastewater System	Water/Sewer	
4	Prichard Wastewater	Water	$3,300,000
12	City of Kenova Water System Improvements	Water	$7,100,000
13	Town of Ceredo Water System Upgrade	Water	
19	Town of Wayne Water Treatment Plant upgrade	Water	$3,819,000
31	Crockett, Miller's Fork Water–Phase 2	Water	$2,915,000
83	Town of Fort Gay Water Extension	Water	$750,000
90	Crum-Kenova-Route 152/Exho/Joel's Branch Water–Phase 3	Water	$200,000
118	Hubbards Branch Water	Water	
	TOLSIA Highway (US 52) Huntington to Williamson	Highway	$710,000,000

Source: WVDO 2005

Part of the WVDO plan also addresses transportation needs. Highway improvements are scheduled to complete the Appalachian Corridor, a network of 4-lane expressways throughout the state. The TOLSIA Highway, following Highway 52, will be a major construction project from Williamson in Mingo County (to the south) through the west side of Wayne County to Huntington. The southern portion of

Highway 52 will be extended by the King Coal Highway, which is ready to begin construction. The King Coal Highway will connect through Bluefield to Virginia and Highway 77.

4.0c CUMULATIVE EFFECTS ANALYSIS

The specialists then identified the effects these actions are expected to have on the baseline condition of the resource. With these effects identified, the specialist determined cumulative effects of these separate actions. The specialists also assessed the incremental contribution of each alternative. Subsequently, the specialists established criteria that would be used to determine significance of these cumulative effects based on their context and intensity, and assessed the effects based on these criteria.

Identifying cumulative effects can be difficult, given the range of activities that are conducted within any given area in even the less industrial, more rural portions of our country such as Wayne County. Even in these rural areas, multiple land uses are the rule rather than the exception, and this fact makes land use planning a challenge for any land management agency, be it federal, state, or local. No set manner of evaluating cumulative effects is established within the NEPA guidelines. For this environmental analysis, potential impacts of the alternatives were considered in combination with impacts of other actions that have occurred, or are foreseen to occur, on or near the proposed lease tracts.

The 17 resources addressed in this FLUA/FEIS have been evaluated for cumulative effects. Where appropriate, a more in-depth description of cumulative effects is provided in the following resource descriptions.

4.1 GEOLOGIC AND MINERAL RESOURCES

4.1a Study Area

The cumulative effects geologic study area is the USACE East Lynn Lake Project lands, plus the permitted areas of Rockspring's and Argus' past and present mining operations to the north, east and south.

4.1b Baseline Condition

Baseline geologic conditions within the lease tracts are described in section 3.1 (Geology). Impacts to geologic conditions include naturally-occurring processes and human-induced activities, such as surface and underground coal mining, coal processing, coal waste storage, oil and gas development, construction and maintenance of the USACE East Lynn Lake Project facilities, recreational activities, construction of linear utilities, and regional infrastructure. These activities can cause subsidence or changes in slope stability and can contribute to the potential for and/or trigger landslides. Impacts to geologic resources have been localized or minimized as quickly as possible, and the baseline condition is below any sort of threshold where a change in the resource condition would be detrimental.

4.1c Actions

4.1c1 Proposed Action (Preferred Alternative)

Proposed mining activities are expected to have minimal to no surface impacts or changes to geologic conditions, provided that pillars are adequately sized, barrier zones are maintained and local control measures are practiced as described in chapter 3. Potential surface effects would be reduced and long-term stability of pillars would be maximized provided barrier zones and pillar sizes were maintained. No direct or indirect impacts to the stability of the dam or the integrity of the lake are expected.

Proposed surface activities could cause localized impacts to slope stability, leading to slumps or landslides if the toe of an existing landslide is excavated, if the head of an existing landslide is overloaded, or if soil or weak bedrock becomes saturated or weakened. Slope failure is expected to be low provided that inactive and active landslide locations are either avoided or adequate mitigation measures are implemented during these activities to maintain slope stability.

Under the RFDS, available coal reserves would be reduced. However, the coal is being used to meet the national energy demand.

On-going, existing oil-and-gas and recreation-related impacts to geologic resources are minimal, and would continue at a similar level.

4.1c2 No Action Alternative

On-going, existing oil-and-gas and recreation-related impacts to geologic resources are minimal, and would continue at a similar level.

4.1c3 Other Coal Mining

No specific impacts to geologic resources have been identified related to historical non-commercial or commercial mining of the No. 5 Block or other seams.

Exploratory drilling activities, including road and drill pad construction, can reduce the vegetation cover, causing erosion and leading to localized slumps or landslides. Existing landslides can also be re-activated during excavation activities. Historical exploration activities have not caused significant landslide events. Over the coming 20 to 30 years, additional exploratory drilling may occur, with similar impacts.

Surface mining activities can impact geologic resources by causing landslides and slumping. These impacts can be minimized and are not expected to be significant, provided that proper control measures are implemented. Historical and present operation of and construction of coal refuse piles and slurry impoundments has impacted geologic resources. Geotechnical berm construction for a slurry impoundment was not adequate to provide sufficient capacity and resulted in discharge of suspended solids. Impacts from this event were localized, and are not considered significant. Construction or expansion of coal refuse pile or slurry impoundment facilities is not expected to cause significant impacts to geologic resources, provided that adequate mitigation measures are implemented during these activities to maintain slope stability, and provided construction of slurry impoundments are adequately sized.

Underground mining activities can impact geologic resources by causing subsidence. Historical underground mining likely caused localized surface effects in the form of minor cracks. Current and

planned underground mining methods have been designed conservatively to reduce the impacts to geologic baseline conditions caused by these activities.

The existing geotechnical controls are expected to be maintained during the extended lifetime of existing coal-washing facilities, coal refuse piles, and slurry impoundments. Extending the life of existing facilities is expected to have impacts to geologic resources. Similarly, these ground control measures are expected to be used during the construction, maintenance, and closure of any new facilities, and potential impacts are expected to be limited.

4.1c4 Oil and Gas Development

Geologic Resources–During construction and maintenance of surface facilities, oil and gas companies will use heavy equipment to remove vegetation, compacting soils. In addition, they may move or excavate soils during construction, maintenance, and repair of oil or natural gas wells, drill pads, and associated collection pipelines and access roads. Excavation activities, especially at the toe of a slope, can cause localized soil slumping, or the activation or re-activation of a landslide. In addition, impacted soils are more susceptible to erosion. In time, erosion and cracking of surface soils can lead to localized slumps or landslides.

Historical development activities may have impacted geologic resources. Adequate mitigation measures have been implemented to maintain slope stability, and no significant impacts to geologic resources have occurred. Future development would impact 24 to 60 acres on the proposed lease tracts (BLM 2007b) and additional acreage on private lands. These impacts may result in short-term, indirect erosion and sedimentation impacts to soils and vegetation for a period of up to 6 weeks, and long-term, indirect impacts on up to 40 acres for up to 20 years. To minimize impacts, sediment control fencing and fabrics are required to be used in sediment control. In some cases the construction of sediment ponds may be required. Access roads may require baffles and other barriers to allow runoff without creating gullies or other erosional features (BLM 2007b). Provided that slope stability is maintained using appropriate mitigation measures, minimal impact to geologic resources is expected.

Construction of new access roads or expansion of existing roads may lead to increased ORV use and illegal timber harvest. These activities may cause compaction and often form trails and ruts that are susceptible to erosion and sedimentation. It is not possible to estimate the level or severity of this impact at this time. However, if all permit requirements involving reclamation and erosion and sediment protection are implemented, and illegal ORV use is controlled, the impacts are expected to be minimal over the next 20 to 30 years.

During drilling of oil or gas wells, oil and gas companies may drill through existing pillars. Coal pillars are designed to support the roof of the mine and minimize strain, fracturing, and slickensides. Engineers consider existing conditions and foreseeable future conditions. If unforeseen events occur in the vicinity of a pillar, that pillar may be compromised and become ineffective at providing roof support. For example, if an oil or gas well is drilled through an existing pillar that was designed only to support the roof, rather than to support the roof and provide a protective barrier around the well, then drilling through that pillar could compromise its strength and reduce stability within the mine and in the rock layers above the mine.

Mineral Resources–Construction of oil and natural gas wells impacts coal reserves in the study area. As described in section 3.1.2 (Geology and Mineral Resources–Environmental Consequences), procedures for mining near oil and gas wells is regulated by WVMSHT (West Virginia Code §22A-2-75) and MSHA. Coal mining companies are required to adjust pillar sizes around gas wells of up to 200 feet in diameter to address safety issues and minimize potential surface effects. Up to 7,800 tons of coal would form this one protective barrier and would not be recovered, or would be rendered inaccessible. The revenue for that coal is lost, and the value of the coal reserve is reduced.

At least 144 gas wells exist on the proposed lease tracts (BLM 2009; appendix B), and many more wells exist on private lands within the study area and throughout the region. Currently, oil and gas companies are proposing to drill 12 to 20 more wells on the proposed lease tracts. It is unlikely that more than 20 wells will be drilled in the proposed lease area. Well lives in this area may exceed 20 years. Oil and gas companies are likely to drill an even greater number of wells on private lands throughout the study area (BLM 2007b).

If the Proposed Action is selected and the RFDS is implemented, and if oil and gas companies drill 20 wells through the federal coal, the successful bidder(s) would be required to leave up to 156,000 additional tons of coal in-place in protective pillars around these new wells. At a price of $43/ton, up to $6,708,000 in coal revenue would be lost. Oil and gas development on private lands would cause even more loss of resource and revenue. Historical, current, and future oil and gas development causes negative impacts to the coal resource. To minimize impacts, oil and gas companies and mining companies may negotiate new well locations in active or inactive coal mine areas.

4.1c5 Construction and Maintenance of the USACE East Lynn Lake Project

Construction of administration and recreation facilities may have reduced the vegetation cover on slopes around the lake, causing erosion and leading to localized slumps or landslides. Existing landslides can also be re-activated during excavation activities. These activities have not caused significant landslide events. Further development of additional recreational facilities is not expected to cause significant impacts to geologic resources, provided adequate mitigation measures are implemented during these activities to maintain slope stability.

4.1c6 Recreational Activities

Over the past two centuries, recreational activities such as hiking, biking, and ORV use have caused erosion and loss of vegetation, which could lead to localized slumping or landslides. Impacts from these activities are not considered to be significant, and would not contribute to detrimental impacts to the geologic resource over the next 20 to 30 years.

Future use of ORVs may cause erosion and loss of vegetation, which may lead to localized slumping or landslides. Throughout the cumulative effects study area, ORV use occurs anywhere an ORV can access or make a new trail or road. However, within the USACE East Lynn Lake Project, ORV use is authorized only on established roads. If access roads are extended or new roads are built, ORV users likely will use these roads to access additional unauthorized areas, and additional new trails and roads would be developed. Use of roads and un-maintained trails will cause additional vegetation loss, erosion and increase the potential for slope failure. However, if, adequate mitigation measures are implemented

during these activities to maintain slope stability and unauthorized ORV use is controlled, the impacts are expected to be minimal over the next 20 to 30 years.

4.1c7 Logging

Logging activities cause erosion and loss of vegetation, which could lead to localized slumping or landslides. If adequate mitigation measures to maintain slope stability are implemented during these activities, and if illegal timber harvest is controlled to the extent possible, impacts to geologic resources should not be significant over the next 20 to 30 years.

4.1c8 Construction of Local Infrastructure

Construction activities cause erosion and loss of vegetation, which could lead to localized slumping or landslides. Existing landslides can also be re-activated during excavation activities. If adequate mitigation measures are implemented during these activities to maintain slope stability, impacts to geologic resources should not be significant over the next 20 to 30 years.

4.1d Estimation of Combined Cumulative Effects

Implementing the RFDS in combination with other past, present and reasonably foreseeable future actions in the area, is not expected to have cumulative effects on geologic resources, with exception of depletion of the national coal resource.

4.1e Significance Criteria

Cumulative effects to geologic conditions would be considered significant if mining methods including the extraction ratio and barriers for structures, streams, and gas wells were modified from that described in the RFDS and chapter 3:

- pillar strength compared to pillar stress, roof or floor failure, and potential surface deformation, using the Bieniawski method as described in *Surface and Subsidence Engineering* (Peng 1992) and shown in table 3.1-2
- damage to structures caused by mining-induced subsidence, at a severity index rating of one or higher, using *Surface and Subsidence Engineering* (Peng 1992) as shown in table 3.1-1
- damage to structures–including road surfaces, dislocation of dam structures, lake containment features, recreational facilities and cemeteries–caused by tensile strains (Table 3.1-3), using USBM Information Circular 8741 (Babcock and Hooker 1977) as shown on figure 3.1-14, *Surface and Subsidence Engineering* (Peng 1992) as shown on figure 3.1-14, and the National Coal Board 1975 (NCB 1975) as shown in Table 3.1-3
- potential for activation of faults based on distance from nearest documented seismic activity
- potential for occurrence of mining-induced landslides
- failure to maintain barrier width required by state and federal regulations
- coal rendered inaccessible (loss quantified in tons or dollars)

4.1f Determination of Significance

No cumulative impacts to geologic resources are expected. None of the significance criteria are exceeded, and cumulative impacts to geologic resources are considered to be insignificant.

In summary, the incremental impact of implementing the RFDS for coal mining in combination with the RFDS for oil and gas development and increased legal and unauthorized ORV use and illegal timber harvest, would be insignificant.

4.2 SURFACE WATER RESOURCES

4.2a Study Area

The cumulative effects study area for surface water resources encompasses the watershed of the East Fork of Twelvepole Creek upstream of the confluence with Laurel Creek including East Lynn Lake, along with the East Fork of Twelvepole Creek from this confluence downstream approximately 10 miles to the confluence with the West Fork of Twelvepole Creek, and Twelvepole Creek from that point approximately one mile downstream to the town of Wayne's water intake. This study area encompasses about 139 square miles, or 88,960 acres, of watershed plus 11 additional miles of stream.

4.2b Baseline Condition

Baseline conditions within the lease tracts are described in section 3.2 (Surface Water Resources). The baseline condition of the surface water resource within the cumulative effects study area is an impacted condition. Surface and underground coal mining, oil and gas development, recreational activities, and logging have occurred within the study area. Completion of the East Lynn Lake reservoir in 1971 changed the flow of water downstream of the dam and water quality within the footprint of the lake itself.

4.2c Alternatives

4.2c1 Proposed Action (Preferred Alternative)

Proposed surface activities could cause localized impacts to soil, including compaction and erosion, over that 10-year period. Streams could be impacted by deposition of eroded sediments.

On-going, existing oil-and-gas and recreation-related impacts to surface water resources are minimal, and would continue at a similar level.

4.2c2 No Action Alternative

Under the No Action alternative, on-going, existing oil-and-gas and recreation-related impacts to surface water resources are minimal, and would continue at a similar level.

4.2c3 Other Coal Mining

Historical surface and underground mining may have caused changes in groundwater and surface water flow patterns, indirectly impacting surface water quantity. Historical surface coal mining, processing and storage activities likely caused erosion and sedimentation of soils and sediments, and indirectly impacted

surface water quality. Historical underground mining, particularly in the No. 5 Block seam, may have affected groundwater quality. If that impacted groundwater discharged to streams, the mining caused an indirect impact to surface water quality.

As described in section 3.2.1 (Surface Water Resources–Affected Environment), surface mining contributes to existing impacts to surface water quantity and quality. Underground mining appears to cause minimal impacts to surface water resources. Current or proposed surface or underground coal mining must comply with state and federal laws and regulations. Consequently, minimal to no subsidence is expected to occur as a result of current or future coal mining activities in the cumulative effects study area. Minimal indirect impacts to surface water quantity, such as changes in stream flow or lake volume, are expected.

The existing water quality controls are expected to continue during the increased lifetime of the coal-washing facilities, coal refuse piles, and slurry impoundments. The effect of extending the life of existing coal processing and waste storage facilities is limited. Discharges to surface water can be expected to fall within established water quality standards for current and future coal mining operations. The existing condition for surface water quality can be expected to continue into the future in individual subwatersheds within the cumulative effects study area that contain current mining operations. Should mining operations commence in different subwatersheds in the future, some impacts to surface water quality in the associated streams can be expected to be similar to those resulting from current mining operations.

Construction of any new surface facilities would result in short-term, direct loss of vegetation. However, the extent of this potential effect is limited to the acreage of the impacted area. Short-term indirect impacts of increased soil erosion and sediment transport would also occur, but these potential impacts are required to be controlled as a permit requirement. However, the extent of these potential effects is limited in time, and would be reduced somewhat by salvaging soil from beneath the footprint, which will be stored for use in revegetating the surface of the coal refuse pile(s) at closure. Rockspring's proposed slurry impoundment and refuse pile facility would result in a direct impact to vegetation on about 184 acres of land, or 0.2 percent of the study area for an extended period of time. Argus' proposed refuse pile expansion would result in a direct impact to vegetation on 20 to 30 acres of land, or 0.08 to 0.12 percent of the study area for an extended period of time. Loss of vegetation at a coal refuse pile would be reduced by revegetating the surface of the coal refuse pile(s) at closure.

During the lifetime of the coal-washing facilities, coal refuse piles, and slurry impoundments, existing water quality controls are expected to continue. Permit-required monitoring and compliance with applicable state and federal regulations are expected to continue. Impacts are expected to be minimal.

As coal reserves are depleted in individual surface and underground mines, those mines are closed or are placed on inactive status. The surface disturbances associated with closed mines are reclaimed in accordance with applicable state and federal regulations. Reclamation activities are expected to continue in the future as currently operating mines exhaust their coal reserves and are closed. Surface reclamation can be expected to improve water quality in the individual streams affected by the mining operation.

Water quality improvements due to surface reclamation are expected to at least partially offset the water quality impacts due to current and future mining actions in the cumulative effects study area for surface water resources.

4.2c4 Oil and Gas Development

Historical construction, maintenance, and repair of oil and natural gas wells drill pads, and associated collection pipelines and access roads may have impacted soils and caused erosion, indirectly impacting surface water quality. These erosional features may continue to affect water quality over the next several years. In many gas fields, reservoir brines are produced in small amounts with the produced gas (BLM 2007b). Improper discharge of drilling fluids or brines in the past may have caused direct or indirect impacts to surface water.

Current or proposed oil and gas development must comply with state and federal laws and regulations. Development activities may involve clearing of vegetation and removal of topsoil on 24 to 60 acres (BLM 2007b), which may result in indirect erosion and sedimentation impacts to surface water for a period of up to 6 weeks, and indirect impacts to water quality due to erosion and sediment transport for up to 20 years. Sediment control fencing and fabrics are required to be used in sediment control. In some cases the construction of sediment ponds may be required. Access roads may require baffles and other barriers to allow runoff without creating gullies or other erosional features (BLM 2007b). Also, as described in the attachment to the RFDS (appendix B), separators and storage tanks may be used to collect the brines, which are removed during well maintenance; state law permits surface spreading of brines as well as treated liquid pit contents. Implementation of these measures would minimize indirect impacts to streams.

Indirect effects of oil and gas development also may include increased access for recreational use. For example, construction of roads for drill rigs and well access could allow increased access for ORVs. These activities may cause compaction and often form trails and ruts that are susceptible to erosion and sedimentation, indirectly impacting surface water. It is not possible to estimate the level or severity of this impact at this time. However, if all permit requirements involving reclamation and erosion and sediment protection are implemented, and illegal ORV use is controlled, the impacts are expected to be minimal over the next 20 to 30 years.

4.2c5 Construction and Maintenance of the USACE East Lynn Lake Project

Construction of administration and recreation facilities has impacted at least 980 acres (or at least 1.1 percent of the cumulative effects study area). Maintenance and further development of these and additional recreational facilities would be performed in compliance with appropriate regulations, and impact to surface water is expected to be minimal over the next 20 to 30 years.

4.2c6 Recreational Activities

Recreational activities, specifically ORV use, likely has impacted surface water resources in the cumulative effects study area. Over the next 20 to 30 years, these activities may cause soil erosion and loss of vegetation on hillsides. The extent of impact would be proportional to the level of activity and size of the vehicles. Increased erosion and loss of vegetation can result in increased in levels of TDS and TSS in surface water resources.

The probability of occurrence of slope destabilization as a result of recreational activities is dependent upon the extent of the activity in one area or how the activities or their impacts are managed. For instance, if trails or roads used by ORVs are maintained or repaired, the probability of occurrence could

be low. Mitigation measures can also be implemented to stabilize slopes and reduce the potential for erosion, sedimentation, and degradation of water quality in surface water resources.

Impacts due to existing activities are reflected in the existing condition, which is described in section 3.2.1. Continued recreational activities, including ORV use, can be expected to continue to result in similar impacts to surface water quality To the extent that ORV use increases in the future, surface water quality impacts also can be expected to increase.

4.2c7 Logging

Logging activities often create ruts, leaving soils more susceptible to erosion and causing indirect impacts to surface water. Past logging activities likely caused ruts and impacted surface water resources. Current or future legal logging activities must be performed in compliance with state and federal regulations. These activities are not expected to impact surface water quantity or quality over the next 20 to 30 years.

Illegal logging may cause soil erosion and loss of vegetation on hillsides, both of which could result in increased suspended or dissolved solids loading to surface waters. The probability and severity of erosional losses as a result of logging is dependent upon the extent of the activity in an area and the way in which the activity or its impacts are managed. For instance, if clearcutting logging methods are used instead of selective methods, the probability of occurrence would be higher. If these activities are well managed–for example, if low-impact logging practices are implemented–the probability of occurrence could be low. However, illegal logging would not be expected to use best management practices normally found in a legal operation. The total extent of illegal logging within the cumulative effects study area is expected to be limited.

4.2c8 Construction of Local Infrastructure

Construction activities likely caused soil compaction and rutting, increasing erosion and impacting surface water. Over the next 20 to 30 years construction activities may contribute to the occurrence of erosion and sedimentation. The probability of erosion and sedimentation is low, provided that construction activities are performed in compliance with federal, state, and local laws, regulations, and permitting requirements.

4.2d Estimation of Combined Cumulative Effects

Implementing the Proposed Action in combination with all of the other past, present and reasonably foreseeable future actions in the area would result in minor impacts to surface water quantity and quality. In some cases, such as surface reclamation of closed mines, the effect may be an improvement of surface water quality.

4.2e Significance Criteria

The significance criteria for cumulative effects to surface water resources are the same as those for impacts assessed due to the Proposed Action or No Action alternatives. The significance criteria for impacts to surface water quantity are:

- a sustained drop in water flow in the streams crossing the proposed lease tracts that would negatively impact the fish or wildlife that use those streams, and/or
- a sustained drop in water level in East Lynn Lake that would negatively impact the existing uses of the lake.

The significance criteria for surface water quality are:

- an exceedance of WVDEP surface water standards, including applicable anti-degradation standards, and/or
- degradation of water quality in any of the streams within the cumulative effects study area to a point where the stream is placed on the WVDEP 303(d) list.

4.2f Determination of Significance

Cumulative effects to surface water are expected to be minor, and be similar to the baseline condition. No significant changes in stream flow or lake quantity are expected. No exceedances of surface water standards are expected.

The proposed mining is not expected to result in significant incremental effects to surface water resources beyond baseline conditions.

4.3 GROUNDWATER RESOURCES

4.3a Study Area

The study area for cumulative effects to groundwater resource is the USACE East Lynn Lake Project lands, plus the permitted areas of Rockspring's and Argus' past and present mining operations to the north, east and south.

4.3b Baseline Condition

The baseline condition of the groundwater resource within the cumulative effects study area is an impacted condition. Surface and underground coal mining and oil and gas development have occurred within the study area. Completion of the East Lynn Lake reservoir in 1971 changed the flow of groundwater within the local valley-floor aquifers. While these actions have likely degraded the groundwater resource, available information suggests that the condition, based on both water quantity and quality, is below any sort of threshold where a change in the resource condition would be detrimental.

4.3c Actions

4.3c1 Proposed Action (Preferred Alternative)

Coal seams often serve as aquifers, holding a certain amount of water. Removal of the federal coal would impact groundwater resources by creating a void and altering the groundwater flow regime. During proposed mining, either the groundwater would drain out of the void, or the successful bidder(s) would pump the water out of the void. After mining, the successful bidder(s) would stop pumping and would seal the mine. Groundwater eventually would seep into the void and fill the space again.

Very few water wells are located on or in the immediate vicinity of the proposed lease tracts. The USACE maintains shallow wells near the proposed lease tracts that provide water to its recreation facilities. Residential wells have been hand-dug or drilled along Cove Gap Creek and Laurel Creek, adjacent to the proposed lease tracts. Most of the wells in the East Fork of Twelvepole Creek watershed upstream of the proposed lease tracts are completed either into the alluvium or the stress-relief fracture zone, to depths of less than 150 feet (MM&A 2002). The Coalburg/Winifrede seam depth is on average about 350 feet below the surface. Impacts to groundwater quantity, such as changes to water level in nearby water wells, are expected to be minimal.

Sometimes when coal or the roof or floor material is exposed to water and air, acid mine drainage can form, impacting groundwater quality. As described in section 3.3 (Groundwater Resources) and appendix G, the Coalburg/Winifrede seam typically contains lower amounts of pyritic sulfur than other seams such as the No. 5 Block, and is less likely to form acid mine drainage. Groundwater specialists expect that the water that would fill the void would tend to remain chemically neutral. Impacts to groundwater quality are expected to be minimal.

On-going, existing oil-and-gas and recreation-related impacts to groundwater resources are minimal, and would continue at a similar level.

4.3c2 No Action Alternative

Under the No Action alternative, on-going, existing oil-and-gas and recreation-related impacts to groundwater resources are minimal, and would continue at a similar level.

4.3c3 Other Coal Mining

Surface mining can impact groundwater resources by changing flow regimes. Underground mining can impact water resources by changing flow regimes or affecting water quality. Historical mining has likely impacted groundwater resources. Existing surface-mining-related impacts to groundwater have not been documented. Some reports indicate that Rockspring's underground, room-and-pillar mining activities impacted water levels in residential wells in the Laurel Creek drainage, while other reports (MM&A 2005) note that changes in water level were attributed to drought conditions. While Argus has received several notices of violation for AMD discharge at one of its surface mining facilities (Maggard 2007e), AMD issues have not been identified in conjunction with the underground mining of the Coalburg/ Winifrede seam. Existing impacts to groundwater resources are minimal, and future impacts are expected to be similar.

Any current or proposed exploration drilling or surface or underground coal mining must comply with state and federal laws and regulations, which are typically established to minimize impacts. Consequently, minimal to no subsidence is expected to occur as a result of current or future coal mining activities in the vicinity of the proposed lease tracts. No changes in vertical or horizontal hydraulic conductivity or seepage are expected. In summary, current and future mining actions in the cumulative effects study area are expected to cause minimal impacts to groundwater resources.

4.3c4 Oil and Gas Development

The gas resource being exploited in the study area is much deeper than the coal seams in the study area. When oil or gas wells are constructed, the well casings are installed and the well is sealed for its entire depth, except where the well intercepts the oil or gas reserve. Oil and gas development can impact groundwater resources if seals are not properly completed, or if brines are handled or disposed of improperly. Historical oil and gas drilling may have caused minimal impacts to groundwater resources. Current or proposed oil and gas development must comply with state and federal laws and regulations, including those regulating proper handling of brine solutions and those requiring proper casing and sealing of wells. Therefore, no impacts to groundwater resources are expected.

4.3c5 Recreational Activities

Wetland areas, which represent locations where the surface is in direct connection to groundwater, are often favorite places to use ORVs. Unauthorized use of ORVs in wetlands could impact groundwater if a petroleum spill were to occur. Impacts from recreational activities are expected to be minimal.

4.3c6 Logging

Legal logging activities must be performed in compliance with state and federal regulations. These activities are not expected to impact groundwater resources. Illegal logging may occur in the cumulative effects study area. These illegal activities likely would involve removal of a few trees in one location, with minimal impacts to soils, vegetation, or slope stability. Minimal impacts to groundwater resources are expected.

4.3c7 Construction of Local Infrastructure

Construction activities may contribute to the occurrence of slope failures if the toe of an existing landslide is excavated, if the head of an existing landslide is overloaded, or if soil or weak bedrock becomes saturated or weakened. Any of these events may create conduits to groundwater resources. Naturally-occurring landslides are common in West Virginia. However, the probability of occurrence of human-induced slope failure resulting in a landslide is low, provided that inactive and active landslide locations are either avoided or adequate mitigation measures are implemented during these construction activities to maintain slope stability. As a result, the likelihood of creating conduits to groundwater in this way during current or future construction activities is low.

4.3d Estimation of Combined Cumulative Effects

Past, present, and reasonably foreseeable future actions, in combination with the Proposed Action or the No Action alternative, are expected to have minimal cumulative effects to groundwater resources.

4.3e Significance Criteria

The criteria used to assess the significance of potential impacts to groundwater are dictated by the users of the resource, and cover the following two primary areas of concern:

Quantity

- **For wells in the study area**: a significant impact would be a sustained drop in the water level that lowers the water level below the pump for an extended period of time
- **For the streams in the study area:** a significant impact would be a sustained drop in the water table, resulting in decreased baseflow of a stream
- **For the lake:** a significant impact would be a change that impacts the water balance of the lake in a significant manner
- **For riparian vegetation in the study area:** a significant impact would be a sustained drop in the water level in the phreatic zone that sustains plant life

Quality

- **For wells in the study area:** a significant impact would be exceedances of applicable state drinking water quality criteria, which stem from the federal Safe Drinking Water Act.
- **For the receiving streams in the study area and the lake:** a significant impact would be discharge of AMD or other contaminants into a stream or lake

4.3f Determination of Significance

Cumulative effects to groundwater resources are expected to be minimal. No significant changes in water level or in water quality are expected. Therefore, cumulative effects are considered to be insignificant.

The proposed mining is not expected to result in significant incremental effects to surface water resources beyond baseline conditions.

4.4 SOIL RESOURCES

4.4a Study Area

For soils, the cumulative effects study area is the watershed of the East Fork of Twelvepole Creek upstream of the confluence with Laurel Creek. This study area encompasses about 139 square miles, or 88,960 acres, of watershed.

4.4b Baseline Condition

Baseline conditions within the lease tracts are described in section 3.4 (Soils). The baseline condition of the soil resource is impacted. Construction of administrative and recreation facilities has compacted soils within the footprint of these facilities. Surface coal mining, processing and storage of coal, oil and gas development, construction and maintenance of recreation facilities, and recreational activities have impacted the resource. However, because the impact has been localized or minimized as quickly as possible, the condition of the soil resource is below any sort of threshold where a change in the resource condition would be detrimental.

4.4c Actions

4.4c1 Proposed Action (Preferred Alternative)

Under the RFDS associated with the Proposed Action, surface disturbance would occur on a maximum of 20 acres (0.02 percent of the soils cumulative effects study area) over a period of 10 years. Proposed surface activities could cause localized impacts to soil, including compaction and erosion.

On-going, existing oil-and-gas and recreation-related impacts to soil resources are minimal, and would continue at a similar level.

4.4c2 No Action Alternative

Under the No Action alternative, on-going, existing oil-and-gas and recreation-related impacts to soil resources are minimal, and would continue at a similar level.

4.4c3 Other Coal Mining

Historical exploratory drilling activities, including road and drill pad construction, may have compacted soil and formed ruts or other features that are likely to erode. These features may continue to affect soil conditions by causing erosion. Over the coming 20 to 30 years, additional exploratory drilling may occur, with similar impacts. Historical and present operation of surface mines and construction of coal refuse piles and slurry impoundments has caused compaction or displacement of soils. These impacts are not considered to be significant, and would not contribute to detrimental impacts to the soil resource over the next 20 to 30 years.

Construction of any new facilities would result in short-term, direct loss of soil productivity and indirect increased erosion and sediment transport, and longer-term, permanent, indirect loss of soil productivity and increased erosion and sediment transport within the footprint(s) of those facilities. However, the extent of this potential effect is limited to the acreage of the impacted area, and erosion and sediment transport would be controlled, in compliance with permit requirements. Rockspring's proposed slurry impoundment and refuse pile facility would result in a direct impact to vegetation on about 184 acres of land, or about 0.2 percent of the cumulative effects study area for an extended period of time. The extent of potential effect for Argus' proposed facility is limited to 20 to 30 acres (0.2 to 0.3 percent of the cumulative effects area) for an extended period of time. Loss of soil productivity at a coal refuse pile would be reduced by salvaging soil from beneath the footprint, which would be stored for use in revegetating the surface of the coal refuse pile(s) at closure.

4.4c4 Oil and Gas Development

Historical construction, maintenance, and repair of oil and natural gaswells drill pads, and associated collection pipelines and access roads, may have compacted soil and formed ruts or other features that are likely to erode. These features may continue to affect soil conditions by causing erosion over the next several years. Removing topsoil for access roads and drill pads can reduce productivity. Improper discharge of drilling fluids can contaminate soil.

Future development activities will involve clearing of vegetation and removal of topsoil on 24 to 60 acres, or 0.07 percent of the cumulative effects study area, which is expected to result in direct soil impacts of lost soil productivity for up to 6 weeks, and indirect soil impacts of reduced soil productivity and increased erosion and sediment transport on up to 40 acres for up to 20 years. At the time of disturbance, soils would be salvaged to redistribute and revegetate, in accordance with state or federal regulations. About half of the disturbed area will be reclaimed soon after the wells are installed. The remaining drill pad area and access roads will be reclaimed after the well ceases to produce, which can be up to 20 years after development. This effect would be temporary because the soil will be replaced and revegetated, but could take up to 20 years for reclamation to fully occur and pre-disturbance soil productivity and erosion protection to return.

Sediment control fencing and fabrics are required to be used in sediment control. In some cases the construction of sediment ponds may be required. Access roads may require baffles and other barriers to allow runoff without creating gullies or other erosional features (BLM 2007b). Implementation of these measures would minimize direct impacts to soils.

In addition, these potential impacts would be offset somewhat as existing forest stands continue to mature and provide greater vegetation cover, which would reduce erosion losses. Because no timber harvest has occurred on the proposed lease tracts in decades, the stands that were described as noncommercial due to past timber harvest and clearing for pasture in the *East Lynn Lake FEIS* (USACE 1974b) will have progressed toward mature forest with greater vegetation cover. Vegetation resources are further described in section 3.5 (Vegetation). Impacts to soil resources due to oil and gas development are expected to be minimal over the next 20 to 30 years.

4.4c5 Construction and Maintenance of the USACE East Lynn Lake Project

Given that the footprint of the lake at summer pool elevation (662 feet) is about 980 acres, construction of administration and recreation facilities has impacted at least 980 acres of soil, or at least 1.1 percent of the cumulative effects study area. Impacts to soils due to the maintenance and further development of these and additional recreational facilities are expected to be minimal over the next 20 to 30 years.

4.4c6 Recreational Activities

Hiking, biking, and ORV use may have compacted soils and formed ruts or other features that are likely to erode. These features may continue to affect soil conditions by causing erosion. These impacts are not considered to be significant, and would not contribute to detrimental impacts to the soil resource over the next 20 to 30 years.

Future use of ORVs may directly damage or destroy vegetation. In addition, these activities may cause compaction and often form trails and ruts that are susceptible to erosion, which may indirectly impact vegetation. Throughout the cumulative effects study area, ORV use occurs anywhere an ORV can access or make a new trail or road. However, within the USACE East Lynn Lake Project, ORV use is authorized only on established roads. If access roads are extended or new roads are built, ORV users likely will use these roads to access additional unauthorized areas, and additional new trails and roads would be developed.

Throughout the area of cumulative effects, use of roads and un-maintained trails will cause direct impacts to soil productivity and reclamation efforts. Reduced productivity will result in increased erosion and sediment transport, affecting water quality. It is not possible to estimate the level or severity of this impact at this time. However, if all permit requirements involving reclamation and erosion and sediment protection are implemented, and unauthorized ORV use is controlled, the impacts are expected to be minimal over the next 20 to 30 years.

4.4c7 Logging

Logging activities cause impacts to soils including compaction, and loss of soil productivity. Logging activities often cause rutting of soils, leaving those soils more susceptible to erosion. If all permit requirements involving reclamation and erosion and sediment protection are implemented, and illegal timber harvest is controlled to the extent possible, impacts to soil resources should not be significant over the next 20 to 30 years.

4.4c8 Construction of Local Infrastructure

Prior to constructing these linear utilities, the builders will clear vegetation from the surface of the ROW, which compacts soil and reduces productivity. After the builders install the utility, they will maintain the ROW to protect the utility. They will remove any trees and mow the ROW periodically, causing additional compaction. Natural settling and cracking, along with maintenance equipment traveling in the ROW, may cause rills, gullies, or ruts, exposing the soil. Exposed soils, not properly revegetated, could be susceptible to erosion. Construction of existing utilities and roads likely caused limited, direct impacts to soils within the cumulative effects area. Current and future construction would be subject to federal, state, and local regulations. Minimal impact to soil resources is expected.

4.4d Estimation of Combined Cumulative Effects

Implementing the RFDS, in combination with all of the other past, present and reasonably foreseeable future actions in the area would have a potential disturbance of soils of at least 1,275 acres, or at least 0.4 percent of the 139-square mile (88,960-acre) cumulative effects study area for soils.

4.4e Significance Criteria

Cumulative effects to soils would be considered significant if impacts from two or more actions combined to impact 5 percent or more of the existing resource within the cumulative effects study area.

4.4f Determination of Significance

The potential impact of about 1.4 percent of the study area soils is not considered significant.

The incremental impact to a maximum of 20 acres under the RFDS for coal mining, in combination with the RFDS for oil and gas development (temporary direct and indirect loss of soil productivity and increased indirect erosion and sediment transport on a maximum of 60 acres), when added to the actions discussed above, would be insignificant.

4.5 VEGETATION RESOURCES

4.5a Study Area

The cumulative impacts study area for vegetation was considered to be the East Lynn Lake Project area boundary. This area includes approximately 24,833 acres.

4.5b Baseline Condition

Baseline conditions within the lease tracts are described in section 3.5 (Vegetation). The baseline condition of the vegetation resource is impacted. Surface mining, processing and storage of coal, oil and gas development, construction and maintenance of recreation facilities, and recreational activities have impacted the resource. However, because the impact has been localized or minimized as quickly as possible, the condition of the vegetation resource is below any sort of threshold where a change in the resource condition would be detrimental.

4.5c Actions

4.5c1 Proposed Action (Preferred Alternative)

Surface activities could cause localized impacts to soil, including compaction and erosion of soils leading to indirect impacts to vegetation resources on a maximum of 20 acres (0.08 percent of the cumulative effects study area for vegetation) over a period of 10 years. These activities also could have localized direct impacts to vegetation such as damage or removal, over that 10-year period. The analysis of wetlands and riparian resources determined that there are no impacts predicted for these resources (*see* section 3.5.2).

On-going, existing oil-and-gas and recreation-related impacts to vegetation resources are minimal, and would continue at a similar level. The proposed oil and gas exploration will involve clearing of vegetation on 24 to 60 acres (0.22 to 0.0 percent of the cumulative effects study area for vegetation).

4.5c2 No Action Alternative

Under the No Action Alternative, on-going, existing oil-and-gas and recreation-related impacts to vegetation resources are minimal, and would continue at a similar level. The proposed oil and gas exploration will involve clearing of vegetation on 24 to 60 acres (0.22 to 0.0 percent of the cumulative effects study area for vegetation).

4.5c3 Other Coal Mining

Historical exploratory drilling activities, including road and drill pad construction, may have caused damage to or removal of vegetation. Over the coming 20 to 30 years, additional exploratory drilling may occur, with similar impacts. Historical and present operation of surface mines and construction of coal refuse piles and slurry impoundments has caused damage to or removal of vegetation. These impacts are not considered to be significant, and would not contribute to detrimental impacts to the vegetation resource over the next 20 to 30 years.

If additional surface facilities are constructed, the facilities would be constructed using the same standards of practice used to construct and maintain existing facilities and would comply with state and federal regulations. Construction of any new facilities would result in short-term, direct loss of vegetation. However, the extent of this potential effect is limited to the acreage of the impacted area. Construction of Rockspring's proposed facilities would result in direct impacts to vegetation, and would result in a direct impact to about 184 acres of vegetation, or 0.7 percent of the cumulative effects study area, for an extended period of time. Construction of Argus' proposed expansion would result in a short-term, direct impact to vegetation. This proposed expansion would result in a direct impact to vegetation on 20 to 30 acres of land, or 0.08 to 0.12 percent of the study area, for an extended period of time.

Short-term indirect impacts of increased soil erosion and sediment transport would also occur, but these potential impacts are required to be controlled as a permit requirement. Loss of vegetation at a coal refuse pile would be reduced by revegetating the surface of the coal refuse pile(s) at closure.

4.5c4 Oil and Gas Development

Historical construction, maintenance, and repair of oil and natural gas well drill pads, and associated collection pipelines and access roads, may have caused damage to or removal of vegetation. Improper discharge of drilling fluids can affect vegetation.

Over the next 20 to 30 years, oil and gas development will continue. As described in the attachment to the RFDS (BLM 2007b) (appendix B), the proposed oil and gas exploration will involve clearing of vegetation on 24 to 60 acres (up to 0.24 percent of the study area).

About half of the disturbed area will be reclaimed soon after the wells are installed. The remaining drill pad area and access roads will be reclaimed after the well ceases to produce, which can be up to 20 years after development. This effect would be temporary because the soil will be replaced and revegetated, but could take up to 20 years for reclamation to occur. Sediment control fencing and fabrics are required to be used in sediment control. In some cases the construction of sediment ponds may be required. Access roads may require baffles and other barriers to allow runoff without creating gullies or other erosional features (BLM 2007b). Implementation of these measures would minimize indirect impacts to streams. Any proposed oil and gas well development activities would be performed in compliance with existing state and federal regulations. Impacts to vegetation resources due to oil and gas development are expected to be minimal over the next 20 to 30 years.

4.5c5 Construction and Maintenance of the USACE East Lynn Lake Project

Given that the footprint of the lake at summer pool elevation (662 feet) is about 980 acres, construction of administration and recreation facilities has impacted at least 980 acres of vegetation, or at least 4 percent of the cumulative effects study area. Vegetation impacts due to the maintenance and further development of these and additional recreational facilities are expected to be minimal over the next 20 to 30 years.

4.5c6 Recreational Activities

Historical and current hiking and biking use within the cumulative effects study area may have caused direct damage or destruction of vegetation, and may have compacted soils and formed ruts or other features that are likely to erode and cause indirect impacts to vegetation. These features may continue to affect vegetation by causing erosion. These impacts are not considered to be significant, and would not contribute to detrimental impacts to the vegetation resource over the next 20 to 30 years.

As described in Vegetation (section 4.5) above, the use of ORVs may directly damage or destroy vegetation. In addition, these activities may cause soil compaction, reducing soil productivity and the ability for vegetation to establish and survive. ORV use often form trails and ruts that are susceptible to erosion, which may indirectly impact vegetation. It is not possible to estimate the level or severity of this impact at this time. However, if all permit requirements involving reclamation and erosion and sediment protection are implemented, and unauthorized ORV use is controlled, the impacts are expected to be minimal over the next 20 to 30 years.

4.5c7 Logging

Logging activities cause impacts to soils including compaction, loss of soil productivity. Logging activities often cause rutting of soils, leaving those soils more susceptible to erosion. Within the cumulative effects study area, legal logging may occur. If all permit requirements involving reclamation and erosion and sediment protection are implemented, and illegal timber harvest is controlled to the extent possible, the impacts should not be significant over the next 20 to 30 years.

4.5c8 Construction of Local Infrastructure

Prior to constructing these linear utilities, the builders will clear vegetation from the surface of the ROW, which compacts soil and reduces productivity, impacting the ability of vegetation to grow and survive. After the builders install the utility, they will maintain the ROW to protect the utility. They will remove any trees and mow the ROW periodically, causing additional compaction. Natural settling and cracking, along with maintenance equipment traveling in the ROW, may cause rills, gullies, or ruts, exposing the soil to water and potential erosion. Vegetation may struggle to grow in these eroding areas.

Construction of existing utilities, communication towers, and roads likely caused limited, direct impacts to vegetation within the cumulative effects area. Current and future construction would be subject to federal, state, and local regulations. Minimal impact to soil resources is expected.

4.5d Estimation of Combined Cumulative Effects

Implementing the Proposed Action in combination with all of the other past, present and reasonably foreseeable future actions in the area would result in a potential disturbance of vegetation on at least 1,275 acres, or about 5 percent of the 24,833 acre cumulative effects study area for vegetation.

4.5e Significance Criteria

Cumulative effects to vegetation would be considered significant if impacts from two or more actions combined to impact 5.0 percent or more of the existing resource within the cumulative effects study area, or a special status species was impacted.

4.5f Determination of Significance

No special status species, or their habitat, have been identified as being impacted by any of the actions. However, the estimated cumulative effect of about 1,275 acres, or about 5 percent of the study area, is considered to be significant. Over 75 percent of the cumulative effects are due to construction and maintenance of the USACE East Lynn Lake Project. The incremental impact of implementing the RFDS would impact a maximum of 20 acres of vegetation or about 0.08 percent of the total estimated impact of 1,275 acres. This incremental impact is considered to be insignificant.

4.6 FISH AND WILDLIFE RESOURCES

4.6a Study Area

The area of cumulative effects for fish was considered to be the watershed of the East Fork of Twelvepole Creek upstream of the confluence with Laurel Creek including East Lynn Lake, along with the East Fork of Twelvepole Creek from this confluence downstream approximately one mile. This study area encompasses about 139 square miles of watershed plus a little over one additional mile of stream.

The area of cumulative effects for wildlife was considered to be the proposed lease tracts, plus the area within one mile of the proposed lease area boundary.

4.6b Baseline Condition

Baseline conditions within the proposed lease tracts are described in section 3.6 (Fish and Wildlife). The baseline condition of the fish and wildlife resource within the cumulative effects study area is considered impacted. Surface mining, processing and storage of coal, oil and gas development, construction and maintenance of recreation facilities, and recreational activities have impacted the resource. However, because the impact has been localized or minimized as much as possible, the condition of the resource is below any threshold where a minor change in the resource condition would be detrimental.

4.6c Actions

4.6c1 Proposed Action (Preferred Alternative)

Proposed activities would cause minimal direct impacts to fish and wildlife, and are expected to cause minimal impact to soils, vegetation, or water quantity or quality. As a result, minimal indirect impacts to fish or wildlife are expected.

On-going, existing oil-and-gas and recreation-related impacts to fish and wildlife resources are minimal, and would continue at a similar level.

4.6c2 No Action Alternative

Under the No Action Alternative, on-going, existing oil-and-gas and recreation-related impacts to fish and wildlife resources are minimal, and would continue at a similar level.

4.6c3 Other Coal Mining

Historical exploratory drilling activities, including road and drill pad construction, may have damaged or removed soils or vegetation, indirectly affecting wildlife habitat, wildlife, water quality, fish and other aquatic life. Historical and current operation of surface mines and construction of coal refuse piles and slurry impoundments may have damaged or removed soil or vegetation, and elevated TDS and other chemical concentrations in streams. These impacts are not considered to be significant, and have not impacted fish or wildlife significantly. Historical underground mining, particularly in the No. 5 Block seam, may have affected groundwater quality. If that impacted groundwater were to discharge into streams, causing impacts to surface water quality, then aquatic life including fish may be adversely affected.

Over the next 20 to 30 years, additional exploratory drilling may occur. However, mitigation measures would minimize sediment discharge, thereby minimizing other indirect impacts. Underground and surface mining will continue throughout the area of cumulative effects. The existing water quality controls are expected to continue during the lifetime of the coal-washing facilities and slurry impoundments. Permit-required monitoring and compliance with applicable state and federal regulations are expected to continue. Impacts to fish and wildlife are expected to be minimal.

Construction of any new facilities would result in short-term, direct loss of vegetation. However, the extent of this potential effect is limited to the acreage of the facility area. Short-term indirect impacts of increased soil erosion and sediment transport could also occur, but these potential impacts must be controlled as a permit requirement. Loss of vegetation at a coal refuse pile would be reduced by revegetating the surface of the coal refuse pile(s) at closure of operations. Impacts to fish and wildlife are expected to be minimal.

As coal reserves are depleted in individual surface and underground mines, the mines are closed or are placed on inactive status. The surface disturbances associated with closed mines are reclaimed in accordance with applicable state and federal regulations. Reclamation activities are expected to continue in the future as currently operating mines exhaust their coal reserves and are closed. Surface reclamation can be expected to improve terrestrial habitat, as well as water quality in the individual streams affected by the mining operation.

Water quality improvements due to surface reclamation are expected to at least partially offset the water quality impacts due to past, current and future mining actions in the cumulative effects study area. Impacts to fish and wildlife would be minimal, and may be beneficial.

4.6c4 Oil and Gas Development

Over the next 20 to 30 years, development activities may involve clearing of vegetation and removal of topsoil on 24 to 60 acres (BLM 2007b), which may result in indirect erosion and sedimentation impacts to surface water for a period of up to 6 weeks, and indirect impacts to water quality due to erosion and sediment transport for up to 20 years. Sediment control fencing and fabrics are required to be used in sediment control. In some cases the construction of sediment ponds may be required. Access roads may require baffles and other barriers to allow runoff without creating gullies or other erosional features (BLM 2007b). Impacts to wildlife habitat, and therefore wildlife, would be minimal.

During construction and operation of gas wells, some impacts to wildlife may occur. The most common wildlife responses to noise and human presence are avoidance and accommodation. For example, wildlife use of drilling areas will decrease during active drilling and completion activities. As builders complete construction activities and begin operating the wells, noise levels will drop and human presence will decline. No longer threatened, wildlife likely will reoccupy the areas.

Indirect effects of oil and gas development also may include increased access for recreational use. For example, construction of roads for drill rigs and well access could allow increased access for ORVs. The increased ORV use may result in increased injury or death of wildlife. If ORV use were to increase, wildlife use of the area would likely decrease.

4.6c5 Construction and Maintenance of the USACE East Lynn Lake Project

Construction of the dam, and administration and recreation facilities flooded the watershed, creating fish habitat. Over the next 20 to 30 years, maintenance or re-building activities may require a lowering of the lake level. However, impacts to fish should be minimal. Construction of additional recreation buildings may impact wildlife temporarily due to increased noise, but would have minimal to no long-term direct or indirect impacts to wildlife.

4.6c6 Recreational Activities

Historical and current hiking, biking, hunting, and fishing within the cumulative effects study area likely caused minimal to no impact to fish or wildlife. Over the next 20 to 30 years, recreational activities that may impact wildlife include hiking, hunting, camping, fishing, and ORV use. These activities may impact wildlife through direct disturbance. The most common wildlife responses to noise and human presence are avoidance and accommodation. As noted above under Oil and Gas Development (section 4.6c4), wildlife use of an area will decrease during ORV use. Expansion of oil and gas development access roads can lead to increased ORV use and illegal timber harvest, adversely impacting wildlife populations and their habitat.

In addition to direct impacts, recreational activities have the potential to indirectly impact wildlife if vegetation used as habitat is damaged or soils are compacted to the point where plants cannot grow. The extent of impact would be proportional to the amount of disturbance, with single-track trails being of less

impact than two-track roads for 4-wheel drive ORVs. If trails or roads used by ORVs are maintained or repaired, the potential for erosion could be low. Other mitigation measures can be implemented to stabilize slopes and reduce the potential for erosion, sedimentation, and degradation of water quality in surface water resources.

4.6c7 Logging

Logging activities often create ruts, leaving soils more susceptible to erosion and causing indirect impacts to surface water. Current or future permitted logging activities must be performed in compliance with state and federal regulations. These activities are not expected to impact surface water quantity or quality or wildlife habitat. Therefore, impacts to fish and wildlife resources likely would be minimal.

4.6c8 Construction of Local Infrastructure

Construction of existing utilities, communication towers, and roads likely caused limited, direct impacts to soils, vegetation, and surface water within the cumulative effects area. As a result, minimal impacts to fish and wildlife have occurred. Over the next 20 to 30 years, future construction should comply with federal and state requirements, minimizing impacts to soils, vegetation, and surface water thereby minimizing impacts to fish and wildlife

4.6d Estimation of Combined Cumulative Effects

Implementing the Proposed Action in combination with all of the other past, present and reasonably foreseeable future actions in the area would result in minimal direct impacts to fish and wildlife. In addition the combination would result in minor impacts to soils, vegetation, surface water quantity and quality. As a result, minimal to no indirect impacts to fish or wildlife would occur. In some cases, such as surface reclamation of closed mines, the effect may be an improvement of surface water quality. Consequently, implementing the Proposed Action in combination with all of the other past, present and reasonably foreseeable future actions in the area would result in minor impacts to fish and wildlife.

4.6e Significance Criteria

Modifications to the physical geography and hydrology can impact other resources, including fish and wildlife. Cumulative effects would be considered significant if a measurable change in fish or wildlife population abundance occurred due to any of the following:

- impacts to soils, such as loss of soil due to erosion or reduction of soil productivity, that cause significant vegetation losses
- impacts to surface water or groundwater (due to reduction in quantity, flow or quality) that would result in a decrease in aquatic habitat quality
- long-term (greater than 5 years) loss of forest vegetation (terrestrial habitat) that would result in decrease in habitat availability
- long-term (greater than 5 years) modification or degradation of forest vegetation (terrestrial habitat) that would result in a decrease in habitat quality
- disruption of fish or wildlife breeding or nesting activities to the extent that reproductive success is impaired

- reduction in viability of any species through direct mortality or behavioral disruption
- taking of any PETS species without a permit, through habitat loss or otherwise (addressed in section 3.7)

4.6f Determination of Significance

With no direct cumulative effects to fish and wildlife, and with minor cumulative effects to soils, vegetation, and surface water, the cumulative effects to fish and wildlife are not considered significant. In addition, no special status species or their habitat has been identified as being impacted by any of the actions.

In summary, the incremental impact of implementing the RFDS for coal mining in combination with the RFDS for oil and gas development and increased legal and unauthorized ORV use and illegal timber harvest, would be insignificant.

4.7 PROPOSED, ENDANGERED, THREATENED, AND SENSITIVE SPECIES

4.7a PETS Plant Species

4.7aa Study Area

The area of cumulative effects for PETS plant species was considered to be the proposed lease tracts, plus the area within one mile of the proposed lease area boundary.

4.7ab Baseline Condition

As described in section 3.7.2 (PETS Plant Species), no federally listed plant species have been reported in Wayne County. Thus, there is no potential to impact federally listed plant species. Nine rare species, listed in section 3.7.1 (Affected Environment), have been reported in the vicinity of the proposed lease tracts. The baseline condition of habitat for these nine species within the cumulative effects study area is impacted. Surface mining, processing and storage of coal, oil and gas development, construction and maintenance of recreation facilities, and recreational activities have impacted the resource. However, because the impact has been localized, the condition of the resource is below any threshold where a minor change in the resource condition would be detrimental.

4.7ac Actions

4.7ac1 Proposed Action (Preferred Alternative)

Under the RFDS, a maximum of 20 acres of surface disturbance is expected. During proposed surface activities, clearing of vegetation could potentially impact individuals of any of the nine rare species listed in section 3.7.1 (Affected Environment). However, because these nine species are all considered globally secure, the loss of individuals would not constitute a significant impact to viability of any of the species. As described in section 3.1 (Geology and Mineral Resources), minimal to no subsidence is predicted. As described in sections 3.2 and 3.3 (Water Resources), no changes to hydrology are expected that would impact terrestrial vegetation. Therefore, indirect impacts related to subsidence or changes in hydrology

are unlikely. Clearing of vegetation related to surface disturbance may have a beneficial effect on two species (creeping cucumber and climbing fern) which prefer openings related to disturbance.

On-going, existing oil-and-gas and recreation-related impacts to the nine rare plant species or their habitats are believed to be minimal, and would continue at a similar level.

4.7ac2 No Action Alternative

Under the No Action Alternative, on-going, existing oil-and-gas and recreation-related impacts to PETS plant species are minimal, and would continue at a similar level.

4.7ac3 Other Coal Mining

Past and present surface mining activities may have caused limited impacts to individual PETS plant species or their habitats. Over the coming 20 to 30 years, similar mining methods are expected to be used, and any surface disturbance would be performed in compliance with state and federal regulations. Construction of any new surface facilities would result in short-term, direct loss of vegetation. However, the extent of this potential effect is limited to the acreage of the facility area. Short-term indirect impacts of increased soil erosion and sediment transport would also occur, but these potential impacts must be controlled as a permit requirement. Loss of vegetation at a coal refuse pile would be reduced by revegetating the surface of the coal refuse pile(s) at closure. Impacts to PETS plant species population or their habitats are expected to be minimal.

4.7ac4 Oil and Gas Development

Historical development activities may have impacted PETS plant species or their habitats. Over the next 20 to 30 years, surface activities for oil or gas development, as well as any illegal logging or ORV use that is facilitated by construction or expansion of access roads, may impact PETS plant species. The loss of individual plants is possible. However, because the nine rare plant species identified in section 3.7.1 are all considered globally secure, the loss of individuals would not constitute a significant impact to viability of any of the species. Minimal impacts are expected.

4.7ac5 Construction and Maintenance of the USACE East Lynn Lake Project

Construction of the dam and recreation facilities may have impacted PETS plant species populations or their habitats. Over the next 20 to 30 years, maintenance or re-building of the administration and recreational facilities may require clearing of vegetation. The loss of individual plants is possible. However, because the nine rare plant species identified in section 3.7.1 are all considered globally secure, the loss of individuals would not constitute a significant impact to viability of any of the species. Minimal impacts are expected.

4.7ac6 Recreational Activities

Historical and current hiking, biking, hunting, and fishing within the cumulative effects study area likely caused minimal to no impact to PETS plant species or their habitats. Limited damage or destruction may have been caused by ORV use, impacting individual plants or habitat for the nine rare plant species. Over the next 20 to 30 years, similar activities would continue, and impacts are expected to be similar.

4.7ac7 Logging

Historical logging activities remove vegetation, and depending on the extent of the harvest, could impact populations of PETS plant species or their habitats. Current or future logging could impact individual plants. If disturbance is extensive, populations or habitats could be impacted. However, because the nine rare plant species identified in section 3.7.1 are all considered globally secure, the loss of individuals would not constitute a significant impact to viability of any of the species. Minimal impacts are expected.

4.7ac8 Construction of Local Infrastructure

Construction of existing utility corridors, communication tower areas, and roads involved removal of vegetation, and may have impacted individual PETS plants. Current or future construction of road corridors likely will involve vegetation removal. The loss of individual plants is possible. However, because the nine rare plant species identified in section 3.7.1 are all considered globally secure, the loss of individuals would not constitute a significant impact to viability of any of the species. Minimal impacts are expected.

4.7ad Estimation of Combined Cumulative Effects

Implementing the Proposed Action or the No Action Alternative, in combination with past, present, and reasonably foreseeable future actions, would cause minimal cumulative effects to PETS plants within the study area.

4.7ae Significance Criteria

Significant impacts to PETS plant species would occur if there is:

- any taking of federally Proposed, Endangered, or Threatened species, or
- loss of rare species that are likely to contribute to the need for federal listing.

4.7af Determination of Significance

No federally listed plant species have been reported in the area of cumulative effects. Minimal cumulative effects to populations or habitats of the nine rare plant species identified in section 3.7.1 are expected. Because the nine rare plant species are all considered globally secure, the loss of individuals would not constitute a significant impact to viability of any of the species. Cumulative effects to PETS plant species are considered to be insignificant.

The incremental impact of implementing the RFDS in combination with the actions described above would be insignificant.

4.7b PETS Animal Species

4.7ba Study Area

The area of cumulative effects for PETS animal species was considered to be the proposed lease tracts, plus the area within one mile of the proposed lease area boundary.

4.7bb Baseline Condition

Baseline conditions within the proposed lease tracts are described in section 3.7 (Proposed, Endangered, Threatened, and Sensitive Species). Habitat for the Indiana bat, a federally Threatened, Endangered or Proposed wildlife species, may occur within the vicinity of the proposed lease tracts. As described in section 3.7, bat surveys have been performed on existing surface mines in the vicinity of the proposed lease tracts. In total, six bats were captured, none of which are federally listed. Cerulean Warbler habitat would not be removed by the reasonably foreseeable future actions.

The baseline condition of Indiana bat habitat within the cumulative effects study area is impacted. Surface mining, processing and storage of coal, oil and gas development, construction and maintenance of recreation facilities, and recreational activities have impacted the resource. However, because the impact has been localized or minimized as much as possible, the condition of the resource is below any threshold where a minor change in the resource condition would be detrimental.

4.7bc Actions

4.7bc1 Proposed Action (Preferred Alternative)

Under the RFDS, proposed surface activities could involve removal of individual trees, which could impact individual bats. However, minimal direct impacts to the Indiana bat population or its habitat, and are expected.

On-going, existing oil-and-gas and recreation-related impacts to the Indiana bat or its habitat are believed to be minimal, and would continue at a similar level.

4.7bc2 No Action Alternative

Under the No Action Alternative, on-going, existing oil-and-gas and recreation-related impacts to the Indiana bat or its habitat are believed to be minimal, and would continue at a similar level.

4.7bc3 Other Coal Mining

Past and present surface mining activities may have caused limited impact to individual bats or bat habitat. Over the coming 20 to 30 years, similar mining methods are expected to be used, and any surface disturbance would be performed in compliance with state and federal regulations. Construction of any new surface facilities would result in short-term, direct loss of vegetation. However, the extent of this potential effect is limited to the acreage of the facility area. Short-term indirect impacts of increased soil erosion and sediment transport would also occur, but these potential impacts must be controlled as a permit requirement. Loss of vegetation at a coal refuse pile would be reduced by revegetating the surface of the coal refuse pile(s) at closure. Impacts to the Indiana bat population or its habitat are expected to be minimal.

4.7bc4 Oil and Gas Development

Historical development activities may have impacted the Indiana bat or its habitat. Over the next 20 to 30 years, surface activities for oil or gas development, as well as illegal logging, may involve removal of

individual trees, which may impact individual bats. However, activities are expected to cause minimal impact to the population of the Indiana bat or its habitat.

4.7bc5 Construction and Maintenance of the USACE East Lynn Lake Project

Construction of the dam and recreation facilities may have impacted the Indiana bat population or its habitat. Over the next 20 to 30 years, maintenance or re-building of the administration and recreational facilities may require clearing of individual trees to construct buildings. Removal of trees could impact individual bats. However, impacts to the Indiana bat population or its habitat are expected to be minimal.

4.7bc6 Recreational Activities

Historical and current hiking, biking, hunting and fishing within the cumulative effects study area likely caused minimal to no impact to the Indiana bat or its habitat. ORV use may have caused limited indirect noise impacts. Over the next 20 to 30 years, similar activities would continue, and impacts are expected to be similar.

4.7bc7 Logging

Logging activities remove multiple trees, and depending on the extent of the harvest, could impact large numbers of trees. Historical logging may have impacted the Indiana bat or its habitat. Future logging could impact individual bats. If the extent of harvest is significant, the Indiana bat population and/or its habitat may be impacted.

4.7bc8 Construction and Maintenance of Linear Utilities, Communication Towers, and Regional Infrastructure

Construction of existing utility corridors, communication tower areas, and roads involved tree removal, and may have impacted individual bats. However, impacts to the Indiana bat population or its habitat are believed to be minimal. Future construction of road corridors likely will involve tree removal. Some of the trees may serve as summer roosting habitat for the Indiana bat. However, impacts are expected to be minimal.

4.7bd Estimation of Combined Cumulative Effects

Implementing the Proposed Action in combination with all of the other past, present and reasonably foreseeable future actions in the area would result in minimal impact to the Indiana bat or its habitat.

4.7be Significance Criteria

Modifications to the physical geography and hydrology can impact other resources, including PETS species. Impacts to soils and vegetation could result in indirect impacts to wildlife, including PETS species, through alteration of habitat. In assessing potential impacts to PETS species, significant impacts may occur if there would be:

- significant impacts to soils, such as losses of soil due to erosion or loss of soil productivity, that cause vegetation losses to PETS species habitat,

- long-term (greater than 5 years) loss of forest vegetation (terrestrial habitat) that would result in a determination of "likely to adversely affect" for a Threatened, Endangered or Proposed species under the ESA,
- taking of any PETS species without a permit, through habitat loss or otherwise, and/or
- reduction in viability of any species for which a USFWS Conservation Action Plan has been or is being drafted.

4.7bf Determination of Significance

With no direct cumulative effects to PETS animal species populations, and with minor cumulative effects to soils, vegetation, and surface water, the overall cumulative effects to PETS animal species are not considered significant.

In summary, the incremental impact of implementing the RFDS for coal mining in combination with the RFDS for oil and gas development and increased legal and unauthorized ORV use and illegal timber harvest, would be insignificant.

4.8 SOCIOECONOMIC RESOURCES

4.8a Study Area

The cumulative effects study area for socioeconomic resources is Wayne County.

4.8b Baseline Condition

The baseline condition of the socioeconomic study area is described above in section 3.8 (Socioeconomic Resources). The baseline condition of the study area is distressed. Most of the county is considered economically distressed, with the towns of Wayne, East Lynn, and Dunlow having higher poverty levels than either the State of West Virginia or the rest of the county. However, the condition of the economy likely is in transition to a more diversified economic base. Diversified employment opportunities are important to attract younger families to the area to help develop a more vibrant social and economic structure. If current demographic trends continue, the aging population in the study area will become increasingly dependent on transfer payments. The threshold for detrimental change could be crossed if the number of employment opportunities decreases, the pace of outmigration increases, or the tax base is substantially reduced.

The local economy of Wayne County is closely linked to the state and national economy. Risks for economic downturn forecast for the state include: risk of a national economic downturn, rising interest rates, and a decline in state and federal fiscal stimulus. Increasing competitive pressures from Pennsylvania and Maryland in the recreation and services sectors could slow the transition to a tourist economy, especially in the event of a regional or national economic downturn.

Mining is an important part of the economic framework of Wayne County, providing a total of nearly 17 percent of all jobs–direct, indirect, and induced. Other economic opportunities exist in the governmental, tourist and service sectors. Job opportunities have declined through the 1990s in the oil and gas and logging sectors, but are projected to increase with improved economic conditions for the state and nation.

Social opportunities are limited due to the low population density of the planning area. Social constraints in the planning area include the low density of population in areas outside of the regional city of Huntington. When fewer people live in an area, fewer social organizations can be sustained.

Economic opportunities in the planning area are limited due to the rugged terrain and the limited infrastructure of roads and utilities. Without many major roads to provide access, much of the county is considered remote. This rugged terrain is the main economic constraint in the planning area. Few flat areas exist. Excavating or filling an area to create a flat surface suitable for constructing infrastructure or residential or commercial buildings is expensive and often uneconomical.

At some point in the next few decades, the coal reserves in the region will be exhausted. When the coal companies close their operations, the people currently employed at these facilities would lose their jobs. A decline in income would be expected due to this job loss. A decline in demand for housing would also be expected.

4.8c Alternatives

4.8c1 Proposed Action (Preferred Alternative)

The Proposed Action consists of leasing the rights to mine coal beneath the identified tracts under a competitive bidding process. Under the RFDS associated with the Proposed Action, mining jobs and related economic benefits to Wayne County and the region would continue as the life of the mines would be extended. The resulting economic stability would allow the economy to diversify over time as economic development plans are implemented.

Extending mining jobs in the study area would also be important to sustaining the existing tax base, which includes property tax, income tax, coal severance tax, and royalties. By extending the duration of the mining jobs, wages, industrial output, and taxes and by extending other associated jobs, wages, industrial output, and taxes generated as a result of multiplier effects, the coal companies would help to facilitate the regional economy's transition from a more industrial economy to a more service-based economy. As a result, a sustained level of income would be expected. Current housing trends described in section 3.8.1b6 (Housing) also would be expected to continue.

Existing impacts to infrastructure–traffic and degradation of road surfaces–would continue as the current level of coal truck traffic would be extended another 10-15 years into the future. The socioeconomic impacts of the extended duration of coal truck traffic might be to continued limited access to and limited appeal of the local community to outsiders, continued costs of maintaining the roads, and continued rates of death and injury due to accidents as described in section 3.8.1b2 (Population Trends). However, continued state and local tax revenues could be applied to road maintenance and planned infrastructure improvement projects which would minimize these impacts.

As a result, no significant negative economic impacts would occur under the Proposed Action. No significant negative impacts to social conditions would occur. No significant new impacts to natural resources that would impact economic conditions are expected. Instead, beneficial impacts to economic and social conditions would occur.

4.8c2 No Action Alternative

Under the No Action Alternative, the LBAs would be denied, and no coal leasing or mining would occur beneath the lease tracts. Over the coming decades, a less stable economic environment would most likely develop as current reserves are exhausted and attrition in mining jobs would be expected unless further reserves are developed. A weakened economy would likely result in outmigration and depressed housing costs. A reduced tax base could possibly reduce access to government services and diminish social infrastructure.

The revenues and royalties expected under the Proposed Action, detailed in section 3.8.2d2 (Socioeconomic Impacts–No Action–Economic Resources), would not be received. Using a federal royalty rate of 8 percent applied by the U.S. Minerals Management Service on the sale of federal coal from underground mines, the federal government would lose the opportunity to retain up to approximately $22,600,000 in royalties on this federal coal. Most importantly, Wayne County would lose the opportunity to receive distributed federal royalties totaling up to approximately $67,800,000. The transition envisioned in various state and regional plans, from an industrial economy to a service economy, could be delayed significantly.

The existing environmental impacts from on-going coal mining, such as the presence of haul trucks on roads and resulting degradation of the roads, noise, and localized entrainment of dust would continue for the lives of the existing mines. Environmental impacts could occur from any of the other expected future actions, some of which may be significant.

Under the No Action alternative, social institutions in Wayne County would likely be threatened by a weakened economy and the loss of mining company philanthropy in the next 10 to 15 years. Out-migration resulting from fewer jobs would reduce financial support for social institutions such as schools and churches. A smaller population would likely support fewer social institutions, possibly threatening the social web of the area.

Negative impacts to social and economic conditions could be expected to occur under the No Action Alternative.

4.8c3 Other Coal Mining

Current and new underground or surface coal mining must be performed in compliance with state and federal laws and regulations. The marketability of the remainder of the coal reserve is questionable and access issues may render much of it uneconomical. As described in section 3.8. 1f3 (Economic Sectors–Coal–Market Conditions) the economic conditions that govern the coal market are unpredictable and are becoming less favorable to the types of coal found in the study area. Uncertainty regarding the permitting process for surface access to the near-surface coal reserves and more stringent regulations on other mining techniques may also make the remaining resources unlikely to be mined in the near future.

If other reserves could be developed, positive economic impacts would include increased employment and an increased tax base that would contribute to a stable economic environment. However, possibly significant new environmental impacts could be expected to occur related to the construction of new coal processing and waste storage facilities if required. If other mining techniques were used to access these reserves, there would more likely be environmental impacts with economic implications. Examples of

these impacts would be: loss of water in wells, pollution of streams and underground water resources, subsidence leading to unsafe structures, or surface disturbances that could make the land unsuitable for other uses. Socioeconomic consequences could include loss of drinking water, loss of recreational resources, and the removal of land from economic development due to the loss of reliable water supplies and unstable geologic environments. Any of these impacts might result in the displacement of residents and a reduced population with negative impacts on the tax base and social institutions.

The probability that mining of other coal reserves using other mining methods will take place is difficult to predict in light of current political and economic uncertainties. When the impacts of Proposed Action are added to the potential impacts of other coal mining, there could be moderate socioeconomic benefits through improved job opportunities and tax receipts or moderately negative impacts through environmental degradation resulting in a drop in property values and therefore, lower tax receipts.

4.8c4 Oil and Gas Development

Current and new oil and gas development described in the attachment to the RFDS (appendix B) could extend positive economic effects for Wayne County. However, environmental impacts discussed in section 4.1c4 above, may also have negative socioeconomic implications. Socioeconomic impacts that could result from direct and indirect impacts of oil and gas development include: loss of property values due to degraded drinking water quality as a result of erosion and improper discharge of drilling fluids or brines, increased costs of monitoring unauthorized ORV use on access roads established for oil and gas development, and loss of coal resource that may negatively impact tax receipts.

Impacts of the Proposed Action added to the potential impacts of oil and gas development could have moderate socioeconomic benefits through improved job opportunities and tax receipts and/or moderately negative impacts through environmental degradation. The probability that oil and gas development will take place is high given current permit applications and the projected demand for domestic oil and gas.

4.8c5 Logging

Continued or even increased logging activities will contribute to the economic base, but are not expected to be a major driver in the local economy. While the state forecast is for increased logging, Wayne County is not one of the counties expected to be most affected. Current and new logging activities would be expected to contribute to an improved employment outlook for the county.

Logging trucks could continue to impact local highways due to heavy loads and increased traffic. The environmental impacts associated with continued or increased logging may have socioeconomic implications such as those associated with coal truck traffic.

Illegal logging would not contribute significantly to the economy, but may damage the marketability of specific properties if the resource is diminished or associated impacts degrade the soil or water conditions. Illegal logging could also decrease the attractiveness of the area for recreational activities if the view shed or habitat for game species is impacted.

Impacts of the Proposed Action added to the potential impacts of logging could have moderate socioeconomic benefits through improved job opportunities and tax receipts or moderately negative

impacts through environmental degradation. The probability that increased logging will take place is moderate to low.

4.8c6 Construction and Maintenance of the USACE East Lynn Lake Project and Recreational Activities

Construction of the USACE East Lynn Lake Project made low-cost recreational activities available to Wayne County residents and tourists. Recreation is an important factor in the state's economic development with the opportunities and impacts associated with recreational factors detailed in section 3.12 (Recreation Resources). In addition, it is possible that private development of recreational activities may accompany the County's proposed development of the tourist industry, aiding in the transition to a tourist economy.

An increase in recreation opportunities in the study area could impact socioeconomic resources in both positive and negative ways. Environmental impacts of increased recreational use in the study area could include increased erosion, degradation of habitat as well as changes in wildlife patterns, increased noise, and traffic. Negative socioeconomic impacts could result from the change in lifestyle that would come with the environmental impacts, but would be short-term as the community adjusted. Beneficial socioeconomic impacts could result from economic opportunities resulting from the development of tourist services. Property values could increase as the area is perceived to be more of a destination for recreational activities.

While the increase in employment could be positive, many of the employment opportunities are low-paying or seasonal, sometimes both. Job opportunities in the tourist and services industry may attract minorities or more economically disadvantaged to the area, eventually creating environmental justice communities. A stable economic environment is important to support these communities in terms of governmental services and long-term economic opportunities.

Illegal ORV use could negatively impact the marketability of specific properties and decrease the attraction of the area for other recreational activities.

Impacts of the Proposed Action added to the potential impacts of recreational activities could have moderate socioeconomic benefits through improved job opportunities or moderate to high negative impacts through environmental degradation. The probability that recreational activities will increased is high given current development plans.

4.8c7 Construction of Local Infrastructure

Infrastructure development is necessary to facilitate growth in the area and to increase accessibility of the recreational opportunities fundamental to the tourist trade in the area.

The TOLSIA highway, in particular would provide more efficient access to Kentucky and Ohio, and by connecting to the King Coal Highway, to Virginia. However, since the development of the King Coal Highway is expected to begin soon, communities along this route in neighboring counties are already planning for economic development and may have a competitive advantage over the small communities in Wayne County. Because truck transportation of harvested timber and processed coal has added significant traffic and degraded the local highways in Wayne County, infrastructure developments would

improve overall safety and access to the area. However, maintenance and improvement of local roads subjected to coal and logging trucks are dependent on a stable tax base.

Water and sewer improvements would provide positive impacts to property values and quality of life for current and future residents. Capital improvements for recreation would encourage the transition to the tourist and service industries planned for diversification.

Future power transmission or distribution line, telephone line, water line, or communication tower construction activities may contribute to increased employment in the construction sector. These are moderately high-paying jobs that could replace jobs currently in the natural resources sector, such as mining, logging, and agriculture. Infrastructure improvements could make the area more likely to attract future development. Without infrastructure improvements, the area is unlikely to support an increase in population or added jobs.

All of the planned construction activities may result in changes to the natural environment, but with proper planning these impacts should be short-term and not have significant indirect socioeconomic impacts.

If construction activities should attract outside laborers, it is possible that there would be temporary or permanent increases in minority or more economically disadvantaged populations coming to the area, as has happened in other parts of the county. A stable economic environment is important to support these communities in terms of governmental services and long-term economic opportunities.

Impacts of the Proposed Action when added to the potential impacts of developing local infrastructure could have moderate to high socioeconomic benefits through improved job opportunities and access to other economic opportunities in the region, and by making the local area more accessible for future development. Environmental impacts are more difficult to assess because they would be dependent on the type of development that takes place as a result of improved infrastructure. The probability that infrastructure improvements will take place is moderate to high, though current plans may be delayed or curtailed due to economic uncertainties.

4.8d Estimation of Combined Cumulative Effects

Implementation of the Proposed Action, in combination with other past, present, and reasonably foreseeable future actions would cause major beneficial cumulative effects to socioeconomic resources. While the incremental impacts of the Proposed Action would only affect a small part of the economy for a short period of time, continuation of mining in the area would help to stabilize an economy in transition from dependence on mining, oil and gas, and logging sectors to the services and tourist sectors. The next two decades could be a critical time to improve the economic health of the study area and a last opportunity to preserve positive attributes of the current way of life. The current social structure would continue or possibly improve if the economic future is held stable or improves.

The cumulative effects of reasonably foreseeable actions may cause minor to moderate impacts to natural resources such as water, plants, or animals within the cumulative effects study area. The resulting socioeconomic impacts would primarily impact property values. The impacts to property values may be both negative and positive and are likely to be localized to individual properties resulting from specific impacts described above.

Employment levels in the study area would be maintained, slowing the rate of outmigration documented over the past two decades. Tax revenue would continue at current levels for the extended lives of the mines. Extension of jobs and tax base in the cumulative effects study area would likely continue support for social institutions like schools, churches and outreach centers. Minor beneficial impacts to recreation opportunities may occur.

In contrast, implementation of the No Action Alternative presents a major change in the economic and social stability of the area and in combination with other past, present, and reasonably foreseeable future actions could cause negative cumulative effects to socioeconomic resources. Recent trends in outmigration would continue which could in turn negatively impact the fragile support for social institutions that currently exists.

4.8e Significance Criteria

The significance criteria for cumulative effects to socioeconomic resources are the same as those for impacts assessed due to the Proposed Action or No Action alternatives discussed in section 3.8.2b (Socioeconomics–Environmental Consequences–Significance Criteria). The demographic, social, and economic indicators used to assess potential cumulative impacts to socioeconomic resources are:

- change in outmigration rate,
- gain or loss of existing social institutions,
- change in the condition of natural resources,
- gain or loss of the facilities or areas that provide recreation opportunities,
- change in employment, unemployment, and overall job growth,
- change in earnings, or
- gain or loss in taxes and other forms of revenue to private companies and federal and local governments.

If significant impacts to employment, job growth or decline, sector growth or decline, or revenues would be expected, then the impact to socioeconomic resources would be considered significant.

4.8f Determination of Significance

Cumulative effects to socioeconomic resources are more likely to be considered significant under the No Action alternative in combination with other past, present, and reasonably foreseeable future actions. Implementation of proposed mining under the RFDS would result in significant positive incremental effects to socioeconomic resources. Jobs would be extended and substantial tax revenues would be generated. Maintaining or improving the status quo economic environment would allow for infrastructure development, continued or improved community resources, and development of the tourist and service industries to transition to a more diversified economy.

When considering cumulative effects under the Proposed Action and RFDS, significant beneficial effects are expected by extending the status quo. Employment opportunities could be expanded and the tax base would support maintenance and capital improvements. Property values could be expected to increase, except for those with negative impacts to natural resources. If the outmigration could be slowed or

stopped, social institutions could be expected to continue to provide the services necessary to support the basic standard of living now enjoyed.

When considering the No Action Alternative and NAS, significant detrimental effects are expected in the near term. Loss of employment opportunities, tax base, and social infrastructure would be anticipated in the next two decades. Employment likely would decline, and outmigration likely would continue at existing levels or even increase. Since the incremental impacts would be significant in a sector that has long been an economic driver in the study area, cumulative effects under the No Action Alternative would be negative unless positive impacts from other foreseeable and planned development could be implemented in the next decade. It is possible that infrastructure improvements, oil and gas development and increased logging and recreational activities would mitigate the expected negative impacts, but these would depend on a robust state and national economy. The No Action Alternative would likely remove the coal resource from the tax base for the foreseeable future.

In summary, the Proposed Action, and associated RFDS, added to other anticipated and likely projects maintain the status quo in the near future. The No Action Alternative, and the associated NAS, likely represent a loss of economic and social stability that could significantly impact the study area.

4.9 ENVIRONMENTAL JUSTICE

4.9a Study Area

The cumulative effects study area for environmental justice is Wayne County.

4.9b Baseline Condition

Baseline conditions for environmental justice communities within the study area are described in section 3.9 (Environmental Justice). The baseline condition of the environmental justice communities is not impacted. While most of the county can be considered economically distressed, there are no distinct communities that would be disproportionately impacted. Wayne County has almost no minorities and they are dispersed throughout the population. Concentrations of minority and poor are most likely to develop in the metropolitan area of Huntington or in the town of Wayne where community services are provided for the economically disadvantaged population.

The condition of the environmental justice community is below any sort of threshold where a change in the resource condition would be detrimental.

4.9c Actions

4.9c1 Proposed Action (Preferred Alternative)

The Proposed Action consists of leasing the rights to mine coal beneath the identified tracts under a competitive bidding process. Under the RFDS associated with the Proposed Action, mining jobs and related economic benefits to Wayne County and the region would continue as the life of the mines would be extended. The resulting economic stability would allow the economy to diversify over time.

Because Wayne County does not have a sizable minority population, this continued economic stability would not disproportionately affect minority populations. However, extending the duration of these jobs

would help to maintain the economy of the region and provide economic opportunities for the poor. Extending these jobs would also be important to sustaining the existing tax base, which includes property tax, income tax, coal severance tax, and royalties. This reliable tax base in turn would extend existing access to government services for the poor.

Positive impacts from the proposed mining include extending the duration of the existing stable economic environment, which would benefit all sectors of the community. No negative impacts are expected as a result of the Proposed Action and associated RFDS.

4.9c2 No Action Alternative

Under the No Action Alternative, the LBAs would be denied, and no coal leasing or mining would occur beneath the lease tracts. If environmental justice communities were to exist, negative impacts to environmental justice could include a loss of job opportunities, and with a less stable economic environment possibly reduced access to government services and to recreational facilities.

4.9c3 Other Coal Mining

Current and new underground or surface coal mining must be performed in compliance with state and federal laws and regulations. If environmental justice communities existed, no negative impacts to environmental justice would be expected if standard permitting procedures are followed to minimize environmental impacts to natural resources. Positive impacts from new mining activities would include increased job opportunities and contributing to a stable economic environment. These impacts would benefit all sectors of the community and help to reduce the level of poverty in the area.

4.9c4 Oil and Gas Development

Current and new oil and gas development must be performed in compliance with state and federal regulations. If environmental justice communities existed, no negative impacts to environmental justice would be expected if standard permitting procedures were followed. Additional development associated with oil and gas activities could expand positive economic effect, but would be unlikely to affect poor or minority communities more than the remainder of the population.

4.9c5 Logging

Current and new logging activities must be performed in compliance with state and federal laws and regulations. If environmental justice communities existed, no negative impacts to environmental justice would be expected if normal permitting procedures were followed.

Illegal logging could impact environmental justice, but the impacts would be unlikely to affect poor or minority communities more than the remainder of the population.

4.9c6 Construction and Maintenance of the USACE East Lynn Lake Project Recreational Activities

Recreational activities, specifically ORV use, may occur in the cumulative effects study area. If environmental justice communities existed, these impacts would be unlikely to affect poor or minority communities more than the remainder of the population.

It is possible that private development of recreational activities may also develop as part of the proposed development of the tourist industry. Job opportunities in the tourist and services industry may attract minorities or more economically disadvantaged to the area, eventually creating environmental justice communities. A stable economic environment is important to support these communities in terms of governmental services and long-term economic opportunities.

Access to affordable recreation–such as hiking, picnicking, wildlife watching–is an advantage that Wayne County can offer environmental justice communities. Because the East Lynn Lake recreation area is a federally-sponsored project, affordable recreation opportunities are expected to continue. If environmental justice communities existed, these impacts would be unlikely to affect poor or minority communities more than the remainder of the population.

4.9c7 Construction of Local Infrastructure

Future power transmission or distribution line, telephone line, water line, or communication tower construction activities may contribute to the occurrence of erosion and sedimentation. If environmental justice communities existed, these impacts would be unlikely to affect poor or minority communities more than the remainder of the population.

It is possible that construction activities may attract minorities or more economically disadvantaged to the area, eventually creating environmental justice communities. A stable economic environment is important to support these communities in terms of governmental services and long-term economic opportunities.

4.9d Estimation of Combined Cumulative Effects

Because no environmental justice communities have been identified in Wayne County, implementing the Proposed Action in combination with all of the other past, present and reasonably foreseeable future actions in the area would not result in impacts to environmental justice communities.

4.9e Significance Criteria

The significance criteria for impacts to environmental justice are disproportionately high or adverse effects to low-income populations, minority populations or children, including:

- loss of job opportunities,
- impacts to personal property, such as subsidence, negative changes in water quantity or quality,
- reduced access to government services, and
- reduced access to recreational facilities.

4.9f Determination of Significance

Baseline conditions for environmental justice provide minimal to no communities that would be impacted disproportionately. Cumulative effects to environmental justice are expected to have no impact because

environmental justice communities have not been identified. The proposed mining is not expected to result in significant incremental effects to environmental justice.

Other past, present, and reasonably foreseeable future actions, in combination with the Proposed Action or the No Action Alternative, would contribute to positive cumulative effects for environmental justice by providing a stable economic base for all communities in the area. If other actions would increase environmental justice communities, a stable economic base would provide continued economic opportunities, allowing these communities the best opportunity to eventually assimilate economically.

4.10 CULTURAL RESOURCES

4.10a Study Area

For cultural resources, the cumulative effects area includes the proposed lease tracts, plus the area within one mile of the proposed lease tracts.

4.10b Baseline Condition

Baseline conditions within the lease tracts are described in section 3.10 (Cultural Resources and Cemeteries). The baseline condition of the cultural resource is impacted. Construction and maintenance of the recreation facilities associated with the East Lynn Lake Project, other coal mining, and oil and gas development have impacted the resource. However, because the impact has been localized, the condition of the cultural resource is below any sort of threshold where a change in the resource condition would be detrimental.

4.10c Actions

4.10c1 Proposed action

Surface activities could impact a maximum of 20 acres. Based on results of the Class I Overview (CRAI 2007), no impacts to cultural resources are expected under the Proposed Action. However, prior to surface-clearing activities, cultural resource clearance would be required.

On-going, existing oil-and-gas and recreation-related impacts to cultural resources are believed to be minimal, and would continue at a similar level.

4.10c2 No Action Alternative

Under the No Action Alternative, the LBAs would be denied, and no coal leasing or mining would occur beneath the lease tracts.

4.10c3 Other Coal Mining

Cultural resources and cemeteries have been impacted by past actions (Anslinger and others 2007). Over the next 20 to 30 years, future actions involving surface disturbance, including exploratory drilling and construction of surface facilities, may impact cultural resources. To comply with federal regulations, mining companies may have to obtain clearance for cultural resources prior to disturbing the surface.

If cultural resources are identified, impacts to those resources could be mitigated, reducing the overall effect.

4.10c4 Oil and Gas Development

Construction of oil and gas drilling sites and the excavation of pipeline trenches will cause surface disturbance and may impact cultural resources. To comply with federal regulations, oil and gas companies may have to obtain clearance for cultural resources prior to disturbing the surface. If cultural resources are identified, impacts to those resources could be mitigated, reducing the overall effect.

4.10c5 Construction and Maintenance of the USACE East Lynn Lake Project

Construction of East Lynn Lake dam, administration, and recreation facilities has destroyed some of the historic buildings and other cultural resources. Cemeteries were removed from the area. Over the next 20 to 30 years, repair or re-building activities would occur within the area already assessed for cultural resources, and no impacts are expected.

4.10c6 Recreational Activities

Recreational activities cause minimal impact to cultural resources and cemeteries, but should be minimal over the next 20 to 30 years.

4.10c7 Logging

Legal logging must be performed in compliance with state and federal regulations. These legal activities are not expected to impact cultural resources and cemeteries. Illegal logging activities may disturb or destroy cultural resources and therefore impact the resources.

4.10c8 Construction of Local Infrastructure

Construction and maintenance of linear utilities or communication towers can involve drilling of shallow holes for poles, or excavation of trenches to lay pipe. In addition, clearing vegetation and moving and excavating soil can cause impacts to cultural resources. To comply with federal regulations, the company or agency causing the surface disturbance must obtain clearance for cultural resources prior to disturbing the surface. If cultural resources are identified, impacts to those resources could be mitigated, reducing the overall effect. Impacts are expected to be limited.

4.10d Estimation of Combined Cumulative Effects

Collectively, known actions have resulted in the destruction of standing historic buildings and structures on USACE East Lynn Lake Project lands, and potential negative impacts to cultural resources, including cemeteries (Anslinger and others 2007), located elsewhere in the cumulative effects area. Future actions are difficult to predict, but are expected to include many of the same types of activities that have taken place in the past, including logging, coal exploration and mining, oil and gas operations, and recreational activities.

4.10e Significance Criteria

The National Historic Preservation Act of 1966, as amended, provides implementing regulations in 36 CFR 800 for agencies to consider the potential for adverse effects to historic properties, and the criteria for historical "significance" relative to listing properties on the National Register of Historic Places.

Significant impacts would be actions that render an otherwise eligible site as ineligible for listing on the National Register. Other significant impacts may include:

- Damage, destruction and exposure of grave sites from family cemeteries, due to subsidence
- Loss of historical integrity at cultural and historical sites, including archaeological sites, due to subsidence,
- Other irretrievable impacts to the historical integrity and eligibility of cultural resources, which could include construction of vent shafts, mining pits and emergency access routes

4.10f Determination of Significance

Historically the cultural resources have been impacted but no additional significant cumulative impacts are anticipated.

4.11 PALEONTOLOGICAL RESOURCES

4.11a Study Area

The area of cumulative effects for paleontological resources includes the proposed lease tracts, plus the area within one mile of the proposed lease tracts.

4.11b Baseline Condition

Baseline conditions within the lease tracts are described in section 3.11 (Paleontological Resources). The baseline condition of the paleontological resource may be impacted. Surface and underground coal mining, oil and gas development, logging, construction and maintenance of the USACE East Lynn Lake project and associated recreation facilities, construction and maintenance of water lines, power lines, and telephone lines have occurred within the area of cumulative effects. These actions have likely impacted the resource. However, because the impact would have been localized, the paleontological resource is below any sort of threshold where a change in the resource condition would be detrimental.

4.11c Actions

4.11c1 Proposed Action (Preferred Alternative)

The proposed mining would cause impacts to paleontological resources, including loss of resources contained in the coal and loss of paleontological research opportunities that may be conducted on the coal.

On-going, existing oil-and-gas and recreation-related impacts to paleontological resources are believed to be minimal, and would continue at a similar level.

4.11c2 No Action Alternative

Under the No Action alternative, the impact to paleontological resources would be low. On-going activities would continue over the next 20 to 30 years, including oil and gas development and recreational activities described in section 3.11.1, and in Oil and Gas Development and Recreation, below. Existing minimal impacts to paleontological resources would continue.

4.11c3 Other Coal Mining

Historical mining of shallow house coal mines in the No. 5 Block seam has likely impacted fossils. Since the mid 1900s commercial surface and underground coal mining has occurred, primarily in the No. 5 Block and Coalburg/Winifrede seams. Over the next 20 to 30 years, mining will continue, though the coal resource is becoming depleted within the area of cumulative effects. Impacts to paleontological resources include loss of resources contained in the coal and loss of paleontological research opportunities that may be conducted on the coal.

4.11c4 Oil and Gas Development

Companies will use heavy equipment to clear access roads and drill pads, and to excavate shallow trenches for laying transmission pipeline. When an oil or gas well is drilled, the drill bit is pushed down into rock, breaking up the rock, including fossils. The activity from drilling is minor because the diameter of the borehole is negligible compared to the total volume of rock. The impact should be low. The impact to paleontological resources is expected to be minor.

4.11c5 Construction and Maintenance of the USACE East Lynn Lake Project

Construction of East Lynn Lake dam, administration, and recreation facilities has covered and potentially impacted paleontological resources by breaking up fossil as bedrock was exposed during dam construction. Over the next 20 to 30 years, maintenance activities may require repair or rebuilding activities. Subsurface disturbance may impact paleontological resources. The effect is expected to be limited.

4.11c6 Recreational Activities

Recreational activities are usually surface activities, and cause minimal impact to rock that contains fossils. The occasional fossil collector may pick up a fossil located at the surface. The impact to paleontological resources should be low.

4.11c7 Logging

Legal logging must be performed in compliance with state and federal regulations. These legal activities are not expected to impact paleontological resources. Illegal logging may occur in the cumulative effects study area. These illegal activities cause surface disturbance and are expected to cause minimal impact to rock that contains fossils. These illegal activities are not expected to impact paleontological resources.

4.11c8 Construction of Local Infrastructure

Construction and maintenance of linear utilities or communication towers can involve drilling of shallow holes for poles, or excavation of trenches to lay pipe. The impact to rock that contains fossils should be minor, except for the occasional breaking of rock that may contain fossils. Therefore, the impact to paleontological resources should be low.

4.11d Estimation of Combined Cumulative Effects

As noted in section 3.11.1, fossils (such as invertebrate, pollen spores, trace fossils and plants) are likely to occur within the geologic units found within the area of cumulative effects. Implementing the Proposed Action in combination with all of the other past, present and reasonably foreseeable future actions in the area would likely result in negative impacts to paleontological resources. The actions would cause a loss of resources contained in any coal that is mined and loss of paleontological research opportunities that may be conducted on the coal. The extent of the impact is unknown. Fossils present in coal are not protected, so any fossils present in the coal are damaged or destroyed during the process and no official record of any findings is kept.

4.11e Significance Criteria

Impacts to paleontological resources would be considered significant if fossils of scientific value are found and destroyed without documentation. With regard to mining, fossils contained within the coal are not protected, and significant impacts would result only if fossils of scientific value are found during surface disturbance or are found in the overburden or floor during mining.

4.11f Determination of Significance

No known scientifically significant paleontological resources have been identified in the cumulative effects area, and no cumulative effects to paleontological are expected.

4.12 RECREATION RESOURCES

4.12a Study Area

The cumulative effects area for recreation resources includes the proposed lease tracts, plus the area within one mile of the proposed lease tracts.

4.12b Baseline Condition

Baseline conditions within the lease tracts are described in section 3.12 (Recreation Resources). The baseline condition for the recreation resource is impacted. The construction of the East Lynn Lake has increased opportunity for recreation within the area and is considered a positive impact. Surface and underground coal mining, logging, incompatible recreational activities, construction and maintenance of power lines, water lines, and telephone lines have occurred within the area of cumulative effects and have impacted the resource. In general, these impacts may be considered negative. Adding positive and

negative impacts together, the overall condition is positive. The recreation resource is below any sort of threshold where a change in the resource condition would be detrimental.

4.12c Actions

4.12c1 Proposed Action (Preferred Alternative)

No direct or indirect impacts to the stability of the dam or the integrity of the lake are expected under the RFDS. Surface water quality is expected to be similar to the baseline conditions that currently exist. Existing, natural and human-induced impacts to recreation resources would continue at minimal levels. Minimal new impact to soils, vegetation, or wildlife is expected. No impacts to the development potential for future use related to recreation are expected. Direct or indirect impact to recreation resources is expected to be minimal.

On-going, existing oil-and-gas and recreation-related impacts to recreation resources are believed to be minimal, and would continue at a similar level.

4.12c2 No Action Alternative

Under the No Action alternative, on-going, existing oil-and-gas and recreation-related impacts to recreation resources are believed to be minimal, and would continue at a similar level.

4.12c3 Other Coal Mining

Where construction of surface facilities or the staging areas for these activities are located near a road, temporary traffic controls will be used, and may negatively impact ease of access for recreation users. These construction or rescue activities may cause direct impact to recreation resources by removing land from recreation use, disrupting opportunities for recreation use or disrupting traffic flow. However, direct impact is expected to be limited.

With regard to indirect impact to recreation, sometimes recreation users perceive mining as a negative feature of an area, and avoid areas where mining occurs. However, within the area of cumulative effects, the USACE East Lynn Lake Project has drawn users to the area for more than 30 years. During that time coal mining has occurred throughout the cumulative effects area, as well as the region. Many people using the local recreation facilities and areas are employed in the mining industry. The presence of mining within the area of cumulative effects has not caused recreation users to avoid the area.

4.12c4 Oil and Gas Development

Oil and gas companies will maintain cleared ROWs and drill pad areas, removing any trees that begin to grow within the area. They may fence the area. The presence of this cleared and possibly fenced area within the wooded landscape can impact the quality of the experience for dispersed recreation users. Access roads or pipeline easement rights-of-way (ROWs) provide expanded access into the wooded interior of the proposed lease tracts and may lead to increased ORV use and timber harvest. These changes may cause direct impacts to dispersed recreation areas, including erosion or removal of land from recreation use, and may cause indirect impacts to the quality of recreation opportunities such as hiking. The extent of these impacts would depend on the location and extent of the disturbance.

With regard to other indirect impacts to recreation, sometimes recreation users perceive oil and gas development as a negative feature of an area, and avoid areas where oil and gas development occurs. However, within the area of cumulative effects, the USACE East Lynn Lake Project has drawn users to the area for more than 30 years. During that time oil and gas development has occurred throughout the cumulative effects area, as well as the region. Many people using the local recreation facilities and areas are employed in the oil and gas industry. The presence of oil and gas development within the area of cumulative effects has not caused recreation users to avoid the area.

4.12c5 Construction and Maintenance of the USACE East Lynn Lake Project

Beginning in 1969, the USACE constructed the dam, administration and recreation facilities, impacting recreation resources in a positive way. Over the next 20 to 30 years, maintenance of the dam will continue. As the dam ages, repairs may cause direct and indirect impacts to recreation resources. The USACE may have to lower the level of the lake to repair or re-build all or part of the dam, and water levels may become too low for boating, swimming, or fishing to occur. Some of these of these activities could also be impacted by sedimentation of the reservoir that naturally occurs over time.

4.12c6 Recreational Activities

Over the past two centuries as people have set aside time to relax and enjoy the outdoors, dispersed recreational activities, including hiking, birding, site-seeing, biking, fishing, hunting, and ORV use have occurred within the cumulative effects area. In 1969, the USACE constructed the East Lynn Lake Project, bringing developed recreation opportunities including boating, swimming, camping and picnicking to the area. Over the next 20 to 30 years, future improvements may include construction of additional boating, swimming, camping, or picnic facilities at the USACE East Lynn Lake Project, or the establishment of private recreation facilities. As West Virginia strives to strengthen the tourism sector of its economy, recreational activities within the area of cumulative effects are expected to continue, and levels of use for camping, hiking and ORV activity are expected to increase at a fairly constant rate.

Recreational activities can impact soils, vegetation, and wildlife. Use of ORVs on authorized trails can cause permanent, direct impacts to wildlife if they injure or kill wildlife. These users can cause temporary, indirect, impacts to wildlife by creating noise. Use of ORVs in unauthorized areas causes these same impacts as well as several others. These ORV riders often compact soils and form ruts. These uses also damage or destroy vegetation. By directly impacting soils and vegetation, these ORV uses leave the land surface more susceptible to erosion and sedimentation, indirectly impacting surface water. They also cause indirect impacts to wildlife by damaging habitat.

Recreational activities can cause impacts on other recreational activities. When ORV users ride their vehicles on or near trails or areas where other recreation users are hiking, birding, or picnicking, the ORV riders impact the quality of the experience for other users. When ORV users ride their vehicles in, through, and near streams and wetlands, they impact soils and sediments, increasing erosion and stirring up sediments. As a result, concentrations of TDS and chemicals in the water increase, impacting surface water quality. Within the East Fork of Twelvepole watershed, this impacted surface water in the streams flows into the lake, impacting the water quality of the lake. Impacts to lake water quality impact fish, thereby impacting fishermen and -women. Swimmers also can be impacted. Over the next 20 to 30

years, impacts to surface water quality are expected to be similar to the baseline conditions that currently exist.

Other actions directly and indirectly impact recreational activities. Roads used to access oil and gas facilities, along with the facilities themselves may degrade the quality of the recreation experience for hikers or birders. Surface facilities associated with mines may have a similar effect.

4.12c7 Logging

If all permit requirements involving reclamation and erosion and sediment protection are implemented, and illegal timber harvest is controlled to the extent possible, minimal impacts should occur over the next 20 to 30 years.

Small-scale illegal logging has occurred on the proposed lease tracts, resulting in localized compaction and erosion of soils. Future illegal timber harvest may occur, due to easier access on gas well roads. The current level of illegal harvest is not well documented, and therefore, it is not possible to quantify the extent that it may increase with increased access. However, if all permit requirements involving reclamation and erosion and sediment protection are implemented, and illegal timber harvest is controlled to the extent possible, direct impacts to recreational facilities or areas should not be significant over the next 20 to 30 years.

With regard to other indirect impacts to recreation, sometimes recreation users perceive logging as a negative feature of an area, and avoid areas where logging occurs. However, within the area of cumulative effects, the USACE East Lynn Lake Project has drawn users to the area for over 30 years. During that time logging has occurred throughout the cumulative effects area, as well as the region. Some people using the local recreation facilities and areas are employed in the logging industry. The presence of logging within the area of cumulative effects has not caused recreation users to avoid the area.

4.12c8 Construction of Local Infrastructure

Prior to constructing these linear utilities, the builders will clear vegetation from the surface of the ROW. The equipment used to clear the vegetation will compact the soil. Where the ROW crosses a road, temporary traffic controls will be used, and may negatively impact ease of access for recreation users. After the builders install the utility, they will maintain the ROW to protect the utility. They will remove any trees that start to grow within the ROW. The presence of these ROWs provides expanded access into the wooded interior of the proposed lease tracts and may lead to increased ORV use and timber harvest, which may lead to increased erosion. The presence of this linear corridor within the wooded landscape can impact the quality of the experience for dispersed recreation users.

Construction and maintenance of communication towers involves clearing an area of vegetation, constructing the tower, and installing control equipment. The utility owner will maintain the area and remove any trees that begin to grow under or near the base of the tower. The presence of this cleared area within the wooded landscape can impact the quality of the experience for dispersed recreation users.

Route 37 passes through the area of cumulative effects. Several other highway construction projects are proposed in western and southern Wayne County within the next several years. These projects are located outside the area of cumulative effects, but the projects may provide improved access for future

use of recreation resources. Construction and maintenance of regional infrastructure activities usually involves clearing vegetation and moving or compacting soil and use of traffic controls around construction equipment. Construction activities could cause temporary traffic delays, negatively impacting ease of access for recreation users. This impact is expected to be minimal.

4.12d Estimation of Combined Cumulative Effects

The overall cumulative effect to recreation resources from past, present, and reasonably foreseeable future actions, in combination with either the Proposed Action or the No Action Alternative, are expected to be minimal because abundant recreation opportunities currently do, and would, remain available.

4.12e Significance Criteria

The cumulative effects to recreation resources will be considered significant if the effects:

- conflict with existing or known future land uses, or adopted land use plans, policies, or ordinances
- conflict with planning efforts to protect the recreational resources, or
- conflict with adjacent land uses as defined by planning documentation.

4.12f Determination of Significance

Cumulative effects to recreation resources do not create conflicts with known or future land uses, planning efforts, or adjacent land uses. Therefore, the cumulative effects to recreation resources are not considered significant.

The proposed mining is not expected to result in significant incremental effects to recreation resources beyond baseline conditions.

4.13 AIR RESOURCES

4.13a Study Area

For air resources, the cumulative effects area includes the proposed lease tracts, plus the area within 10 miles of the proposed lease tracts.

4.13b Baseline Condition

4.13.b1 Air Quality

Baseline conditions within the lease tracts are described in section 3.13 (Air Resources). Figure 3.13-1 indicates the locations of air pollutant emitting facilities in Wayne County. The facilities associated with the numbers on figure 3.13-1 are identified in table 3.13-1. The baseline condition of the air resource is impacted. Earth-moving activities related to surface mining, coal processing, oil and gas development, construction of the recreation facilities associated with the East Lynn Lake Project, ORV use, earth-moving activities related to linear utilities and communication towers, traffic on paved and unpaved roads, and regional power generation have impacted the resource. However, because the impact has been

localized, the condition of the air resource is below any sort of threshold where a change in the resource condition would be detrimental.

4.13.b2 Global Climate Change

The assessment of so-called "greenhouse gas" (GHG) emissions and climate change is in its formative phase; therefore, it is not yet possible to know with confidence the net impact to climate. However, the Intergovernmental Panel on Climate Change (IPCC 2007) recently concluded that "warming of the climate system is unequivocal" and "most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic [man-made] greenhouse gas concentrations."

4.13c Actions

4.13c1 Proposed Action (Preferred Alternative)

The federal coal would be transported to the existing processing plants, extending plant life and existing emissions levels for an additional 10 to 15 years. Minimal indirect impacts to air resources are expected. Surface disturbance would cause minimal local impacts to air resources.

On-going, existing oil-and-gas and recreation-related impacts to air resources do not exceed the significance criteria, and would continue at a similar level.

4.13c2 No Action Alternative

Under the No Action alternative, on-going, existing oil-and-gas and recreation-related impacts to air resources are believed to be minimal, and would continue at a similar level. If mining operations close, air quality in the immediate vicinity of the existing mining operations would likely improve slightly at that time due to a reduction in unpaved road traffic.

4.13c3 Other Coal Mining

Historical mining likely has caused limited impacts to air resources. At existing surface mines, air emissions are limited and localized due to the mountainous terrain. At existing underground mines, air emissions reaching the ambient air areas at the surface are considered to be minimal. A recent study (World Bank Group 1998) indicated that the amount of surface dust generated from an underground coal mine is approximately 0.01 tons of dust per 1,000 tons of coal produced. Consequently, existing activities result in minimal to no impacts to air resources.

Two pollutant point sources located within the cumulative effects study area are coal processing facilities:

- the Argus Preparation Plant (ID number 15 on figure 3.13-1), located 7 km to the south-southeast of the proposed lease area, and
- the Rockspring Preparation Plant (ID number 3 on figure 3.13-1), located 7.4 km to the northwest of the proposed lease area.

The $PM_{2.5}$ and PM_{10} emissions associated with these facilities total approximately 10 and 55 TPY, respectively (Table 3.13-1). The Argus Preparation Plant also has fugitive emissions associated with road

dust from the delivery of coal from the plant to the Wayne County River Terminal in Cyrus, West Virginia. Emissions associated with this activity are emitted over a large area, most of which is more than 10 miles from the proposed lease tracts. As such, these activities are not expected to be significant. The emissions associated with these activities, while substantial over time, are confined to areas very close to the emission release.

Over the next 20 to 30 years, future surface mining and other earth-moving activities may cause minimal, localized impacts to air resources. Operators would control dust to ensure compliance with ambient air standards at offsite locations, and to ensure that worker safety on the site is not compromised.

Based on current market conditions and the regulatory atmosphere, the Applicants may exhaust reserves of marketable coal within the study area. Construction of additional air-emitting facilities is unlikely.

4.13c4 Oil and Gas Development

Historical development within the area may have caused limited impacts to air resources. Over the next 20 to 30 years, additional compressor stations may be built and operated within the cumulative effects study area. These facilities must comply with emissions regulations. Minimal impacts to air resources are expected.

4.13c5 Construction and Maintenance of the USACE East Lynn Lake Project

Construction of East Lynn Lake dam, administration, and recreation facilities may have caused temporary, localized impacts to air resources. Over the next 20 to 30 years, repair or re-building activities may cause limited, localized impacts to air resources.

4.13c6 Recreational Activities

In the mid- to late-1900s, people began using ORVs recreationally. Recreational activities will continue for at least the next 20 to 30 years. Most recreational activities cause minimal impact to air resources. However, ORV use can impact soils, stirring up dust. This dust can impact local vegetation and wildlife. Extensive ORV activity can entrain large amounts of dust into the air. This entrained dust can be picked up by winds, carried into higher levels of the atmosphere, and transported horizontally for long distances. Existing impacts to air resources are limited, and impacts are expected to be similar over the next 20 to 30 years.

4.13c7 Logging

Permitted logging must be performed in compliance with state and federal regulations. Logging activities expose soils to wind and water erosion. Extensive logging can expose large areas of bare soil that is much more susceptible to wind erosion. Historical logging activities often involved extensive clear-cutting and may have impacted air resources. Over the next 20 to 30 years, current and future permitted activities are not expected to impact air resources. Illegal activities may cause limited impacts to air resources.

4.13c8 Construction of Local Infrastructure

Construction and maintenance of linear utilities can involve drilling of shallow holes for poles, and excavation of trenches to lay pipe. In addition, builders use heavy equipment to clear vegetation and move and excavate soil. These clearing and earth-moving activities can cause impacts to air resources. Existing impacts are limited, and impacts from future activities are expected to be limited.

Earth-moving activities associated with road construction likely have caused impacts to air resources, and will continue to do so in the future. Impacts are expected to be limited. Industries associated with construction of regional infrastructure include asphalt manufacturing. One of the three pollutant point sources located within the cumulative effects study area is Mountain Enterprises (ID number 14), an asphalt manufacturer located in Kenova. This existing facility, located about seven miles from the proposed lease tracts, has PM10 emissions of 6 TPY. Its emissions may cause minimal impacts to air resources, although its emissions are not expected to interact with emissions in the vicinity of the proposed lease tracts.

4.13d Estimation of Combined Cumulative Effects

4.13d1 Air Quality

Past, present and reasonably foreseeable actions, in combination with the Proposed Action or No Action alternative, are expected to cause minimal cumulative effects.

4.13d2 Global Climate Change

The lack of scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts. However, potential impacts to air quality due to climate change are likely to be varied. For example, if global climate change results in a warmer and drier climate, increased particulate matter impacts could occur due to increased wind blown dust from drier and less stable soils. Cool season plant species' spatial ranges are predicted to move north and to higher elevations, and extinction of endemic threatened/endangered plants may be accelerated. Due to loss of habitat, or due to competition from other species whose ranges may shift northward, the population of some animal species may be reduced. Less snow at lower elevations would be likely to impact the timing and quantity of snowmelt, which, in turn, could impact aquatic species.

The use of coal as a national energy source would generate GHG emissions, however the location, combustion efficiency, and amount of GHG emissions potentially generated is beyond the scope of this analysis. Since the Proposed Action would simply extend the life of the Applicants' existing, adjoining operations, it is unlikely total GHG emission would change substantially. The No Action alternative could lower direct GHG emissions from mine transportation and processing equipment minimally, it is likely alternative sources would maintain the use of coal at national levels.

4.13e Significance Criteria

Cumulative effects will be considered significant if pollutant emissions exceed the applicable state and national ambient air quality standards and PSD Class II increments.

4.13f Determination of Significance

The cumulative effects to air resources are minimal, and do not exceed ambient air quality standards or PSD Class II increments. Therefore, cumulative effects are considered to be insignificant.

The proposed mining is not expected to result in significant incremental effects to air resources beyond baseline conditions.

4.14 NOISE

4.14a Study Area

For noise receptors, the cumulative effects area includes the proposed lease tracts, plus the area within one mile of the proposed lease tracts.

4.14b Baseline Condition

Baseline conditions within the lease tracts are described in section 3.14 (Noise*)*. The baseline condition of the noise receptor study area is impacted. Surface mining, coal processing, and coal waste storage activities, along with oil and gas development, construction of the recreation facilities associated with the East Lynn Lake Project, ORV use, and construction of linear utilities and communication towers, and have impacted the resource. However, because the impact has been localized, the condition of the resource is below any sort of threshold where a change in the resource condition would be detrimental.

4.14c Actions

4.14c1 Proposed Action (Preferred Alternative)

Under the RFDS associated with the Proposed Action, underground mining would occur. Minimal surface disturbance could occur on a maximum of 20 acres over a period of 10 years.

On-going, existing oil-and-gas and recreation-related noise impacts are minimal, and would continue at a similar level.

4.14c2 No Action Alternative

Under the No Action alternative, on-going, existing oil-and-gas and recreation-related noise impacts are minimal, and would continue at a similar level.

4.14c3 Other Coal Mining

Historical mining, processing, and waste storage activities likely has caused limited, localized noise impacts. Long-term construction activities and activities that involve stationary equipment are more permanent in nature, and may exceed the guideline for recreational areas and unpopulated areas (USEPA 1974). Over the next 20 to 30 years, these impacts will continue at similar levels.

4.14c4 Oil and Gas Development

Historical development within the area may have caused limited noise impacts. Long-term construction activities and activities that involve stationary equipment are more permanent in nature, and may exceed the guideline for recreational areas and unpopulated areas (USEPA 1974). Over the next 20 to 30 years, these activities will continue at similar or slightly higher levels. Limited noise impacts are expected.

4.14c5 Construction and Maintenance of the USACE East Lynn Lake Project

Construction of East Lynn Lake dam, administration, and recreation facilities may have caused temporary, localized noise impacts. Over the next 20 to 30 years, repair or re-building activities may cause limited, localized noise impacts.

4.14c6 Recreational Activities

In the mid- to late-1900s, people began using ORVs recreationally. Recreational activities will continue for at least the next 20 to 30 years. Most recreational activities cause minimal noise impacts. However, hunting causes limited, localized noise impacts. ORV use causes noise impacts. Motorized boats and other watercraft also cause noise impacts. Existing noise impacts are limited, and impacts are expected to be similar over the next 20 to 30 years.

4.14c7 Logging

Logging activities cause noise impacts. Historical logging activities have caused noise impacts within the study area, and similar impacts are expected over the next 20 to 30 years.

4.14c8 Construction of Local Infrastructure

Use of motorized equipment to build the utilities or maintain the ROWs can cause noise impacts. Historical construction and maintenance activities likely have caused localized noise impacts. Future construction activities may exceed the USEPA noise guidelines for recreational areas and unpopulated areas (USEPA 1974). Over the next 20 to 30 years, similar, localized noise impacts are expected.

4.14d Estimation of Combined Cumulative Effects

Long-term construction activities such as historical and proposed construction of linear utilities, and activities that involve stationary equipment such as existing coal processing facilities and existing and proposed oil and gas extraction facilities, are more permanent in nature, and may exceed the USEPA guidelines for recreational areas and unpopulated areas (USEPA 1974). Consequently, past, present and reasonably foreseeable actions, in combination with the Proposed Action or No Action alternative, are expected to cause minor to moderate cumulative effects.

4.14e Significance Criteria

The significance criterion used to assess potential impacts resulting from the RFDS or the NAS is the USEPA guidelines of 70 dBA over a 24-hour period for recreational areas, farm land, and general unpopulated areas (USEPA 1974).

4.14f Determination of Significance

The cumulative effects related to noise impacts are expected to be minor to moderate, and may exceed the USEPA guideline of 70 dBA. Therefore, cumulative effects are considered to be significant.

The proposed mining is not expected to result in significant incremental effects beyond baseline conditions.

4.15 VISUAL RESOURCES

4.15a Study Area

The cumulative effects area for visual resources includes the proposed lease tracts, plus the area within one mile of the proposed lease tracts.

4.15b Baseline Condition

The baseline condition for visual resources is described in section 3.15 (Visual Resources). The baseline condition for the recreation resource is impacted. However, viewsheds are restricted by mountainous terrain of the study area, and impacts are limited. The visual resource is below any sort of threshold where a change in the resource condition would be detrimental.

4.15c Actions

4.15c1 Proposed Action (Preferred Alternative)

Proposed surface activities would cause minimal impacts to visual resources.

On-going, existing oil-and-gas and recreation-related impacts to visual resources are minimal, and would continue at a similar level.

4.15c2 No Action Alternative

Under the No Action alternative, on-going, existing oil-and-gas and recreation-related impacts to visual resources are minimal, and would continue at a similar level.

4.15c3 Other Coal Mining

Surface activities associated with mining have impacted visual resources. Surface mines, processing facilities, coal refuse piles, and slurry impoundments cover large areas and can impact large portions of the foreground, middleground, and background in viewsheds along several roads within the cumulative effects study area. These impacts are somewhat limited due to the mountainous terrain. Construction of additional surface facilities would cause similar impacts to visual resources. Because the terrain is mountainous, impacts to visual resources are limited.

4.15c4 Oil and Gas Development

Within the USACE East Lynn Lake Project, and along Route 37 and several other roads within the cumulative effects study area, existing pipeline ROWs cross the foreground, middleground, and/or

background of a given viewshed and take up small portions of that viewshed. Provided that the height of surface facilities remains below the top of the tree canopy, well sites would not cause direct impacts to visual resources. When constructed, additional pipeline corridors likely would cross viewsheds within the USACE East Lynn Lake Project, and along Route 37 and other roads in the area. Typically the corridors would affect a small portion of the foreground, middleground, and/or background of the viewsheds.

The additional access allowed by access roads and ROWs may cause increased authorized and unauthorized ORV use and illegal timber harvest in the area. These changes can impact soils, causing destruction of vegetation, soil erosion, and rutting. If these impacts occur within a viewshed at the USACE East Lynn Lake Project or along a road within the cumulative effects study area, and the impacts become extensive enough, the presence of the eroded areas could cause direct impacts a small portion of the foreground or middleground of the viewshed. Impacts sufficient to be visible in the background are not expected.

4.15c5 Construction and Maintenance of the USACE East Lynn Lake Project

The construction of the dam and recreation facilities impacted visual resources by impacting the foreground, middleground, and background of viewsheds along Route 37. Over the next 20 to 30 years, maintenance or re-building activities could cause direct impacts to a small or large portion of the foreground, middleground, and/ or background of viewsheds that include the dam.

4.15c6 Recreational Activities

In the 1970s, the USACE constructed its recreation facilities, and since then has continued to develop recreation opportunities. These various structures cause direct, localized impact to the foreground, middleground, and/or background of viewsheds that include them. Over the next 20 to 30 years, the agency will maintain existing facilities and may construct new facilities. These new facilities likely would cause minimal additional impact the viewsheds that include them. Unauthorized ORV use may cause impacts to soils that result in indirect impacts to the foreground or middleground of affected viewsheds.

4.15c7 Logging

Historical logging has caused limited, localized visual impacts to the foreground, middleground, and background of viewsheds within the mountainous study area. Over the next 20 to 30 years, as oil and gas development occurs throughout the study area, construction and extension of access roads and clearing of ROWs will provide easier access for illegal timber harvest. Logging creates gaps in the tree canopy and exposes bare soil. If these areas are located within a viewshed and if the gaps are large enough, the exposed areas will cause limited, direct impacts to the foreground, middleground, or background of the viewshed.

4.15c8 Construction of Local Infrastructure

Existing utility corridors have caused limited, direct impacts to viewsheds within the cumulative effects area. Prior to constructing these linear utilities, the builders will clear vegetation from the surface of the ROW, and after the builders install the utility, they will maintain the ROW to protect the utility. They will remove any trees that start to grow within the ROW. The presence of a cleared linear ROW within a

viewshed will cause a direct impact to visual resources. A utility corridor crosses a viewshed, and typically affects a small portion of the foreground, middleground, and background of the viewshed.

Existing communication towers are located within the foreground, middleground, and background of viewsheds in the USACE East Lynn Lake Project. Because the terrain is mountainous, these impacts are limited. Construction of additional towers would cause additional, limited direct impacts to the foreground, middleground, and background of affected viewsheds.

Roads create a gap in the tree canopy, and in some places the road itself may be visible through the trees. In the mountainous landscape, roads cause a limited direct impact to the middleground or background of viewsheds within the USACE East Lynn Lake Project.

4.15d Estimation of Combined Cumulative Effects

Utility corridors cross multiple viewsheds, and typically affect a small portion of the foreground, middleground, and background of the viewshed. Several surface mines impact large portions of several viewsheds. The mountainous terrain restricts the extent of most viewsheds. As a result, past, present, and reasonably foreseeable future actions, in combination with either the Proposed Action or the No Action Alternative, result in a moderate negative cumulative effect to visual resources.

4.15e Significance Criteria

Cumulative effects to visual resources will be considered significant if large portions of the foreground, middleground, and background of the majority of viewsheds in the cumulative effects area have been impacted.

4.15f Determination of Significance

Cumulative effects to visual resources have not impacted large portions of the foreground, middleground, and background of majority of viewsheds within the cumulative effects study area. Cumulative effects are not considered to be significant.

The proposed mining is not expected to result in significant incremental effects to visual resources beyond baseline conditions.

4.16 HAZARDOUS MATERIALS AND WASTE

4.16a Study Area

For hazardous materials, the cumulative effects study area is the watershed of the East Fork of Twelvepole Creek upstream of the confluence with Laurel Creek.

4.16b Baseline Condition

Baseline conditions within the lease tracts are described in section 3.6 (Hazardous Materials). The baseline condition regarding hazardous materials and waste is not impacted. The environment is below any sort of threshold where a change in the resource condition would be detrimental.

4.16c Actions

4.16c1 Proposed Action (Preferred Alternative)

Materials used within the proposed mines would be limited in quantity due to transport and storage issues. Materials maintained in storage areas at mine portals are maintained in secondary containment. No hazardous material spills, releases, or waste-related spills are expected.

On-going, existing oil-and-gas and recreation-related hazardous material or waste impacts are minimal, and would continue at a similar level.

4.16c2 No Action Alternative

Under the No Action alternative, on-going, existing oil-and-gas and recreation-related hazardous material or waste impacts are minimal, and would continue at a similar level.

4.16c3 Other Coal Mining

No spills or releases have been reported in the study area. Present and future mining must be performed in accordance with state and federal regulations that are protective of the environment. As a result, the likelihood of release of hazardous materials from these facilities is considered to be low.

4.16c4 Oil and Gas Development

One spill or release occurred when a fuel truck overturned in a stream on the proposed lease tracts. Contractors cleaned up the spill in compliance with WVDEP requirements.

Current and future oil and gas development and transmission activities must be performed in accordance with state and federal regulations that are protective of the environment. As a result, the likelihood of release of hazardous materials from these facilities is considered to be low.

4.16c5 Construction and Maintenance of the USACE East Lynn Lake Project

Since construction of the USACE East Lynn Lake Project, the USACE has stored and used small quantities of hazardous materials and oils that are used to perform management activities on the USACE East Lynn Lake Project. These materials are stored in hazardous material cabinets or in secondary containment, in accordance with state and federal regulations. Repair of government vehicles is performed off site or by vendors that bring small quantities of necessary materials on site. No spills or releases have been reported. These activities are expected to continue for at least the next 20 to 30 years. Hazardous materials and waste have caused no impacts to resources. No impacts are expected in the future.

4.16c6 Recreational Activities

No known significant hazardous materials releases or oil spills have occurred on the USACE East Lynn Lake Project. Users of the USACE East Lynn Lake Project participate in activities that may involve hazardous materials or oils, including boating, ORV use, and small-scale illegal logging. During these activities, users may accidentally release materials, either through spills or leaking vehicles and/or equipment. These materials include motor oil, gasoline, diesel fuel, anti-freeze, grease and other

chemicals that may be hazardous materials, or that could violate water quality standards; cause a film, sheen, or discoloration; or cause a sludge or emulsion. Quantities of hazardous materials associated with these uses are typically below the Superfund reportable quantities (RQ), and the potential for hazardous materials release or oil spills from these activities is expected to be low. In the event of a release or spill, the USACE has a procedure for responding to hazardous materials spills (USACE 2006a), and has spill cleanup materials available on site (Smith 2007l).

Users of the USACE East Lynn Lake Project also may perform illegal dumping. Illegal dumps usually are comprised of solid waste with no hazardous material being noted (Smith 2007a).

4.16c7 Logging

Quantities of hazardous materials associated with logging are typically below the reporting quantities, and the potential for hazardous materials release or oil spills from current or future activities is expected to be low.

4.16c8 Construction of Local Infrastructure

No spills or releases have been reported in the area. During future construction activities, builders would be required to maintain spill protection kits whenever using equipment within specified stream protection zones. They would be required to report any spills or releases above Superfund RQs, and to implement clean-up procedures. No impacts are expected.

During future construction activities, builders would be required to maintain spill protection kits whenever using equipment within specified stream protection zones. They would be required to report any spills or releases above Superfund RQs, and to implement clean-up procedures. During operation, secondary containment may be required for storage of certain volumes of chemicals. No impacts are expected.

During construction, builders would be required to maintain spill protection kits whenever using equipment within specified stream protection zones. They would be required to report any spills or releases above Superfund RQs, and to implement clean-up procedures. No impacts are expected.

4.16d Estimation of Combined Cumulative Effects

Implementing the RFDS, in combination with all of the other past, present and reasonably foreseeable future actions in the area would have no cumulative effects.

4.16e Significance Criteria

Cumulative effects regarding hazardous materials and waste would be considered significant if: a Superfund RQ of a hazardous material had been spilled or released, and had impacted surface water or groundwater; or if an oil spill to navigable waters or adjoining shorelines; or an oil spill that could violate water quality standards; or an oil spill that could cause a film, sheen, discoloration, or cause a sludge or emulsion.

4.16f Determination of Significance

No Superfund RQs of hazardous materials have been spilled or released. No petroleum products have been spilled to navigable waters. No waste-related releases have occurred. No significant cumulative effects are expected.

4.17 LAND TENURE, USE, AND ACCESS

4.17a Study Area

For land use, tenure, and access, the cumulative effects study area is the USACE East Lynn Lake Project.

4.17b Baseline Condition

Baseline conditions within the lease tracts are described in section 3.17 (Land Use, Tenure, and Access). The baseline condition regarding land use, tenure, and access is impacted. Nonetheless, the resource condition is below any sort of threshold where a change in the resource condition would be detrimental.

4.17c Actions

4.17c1 Proposed Action (Preferred Alternative)

The Proposed Action could impact a maximum of 20 acres of land surface, directly impacting areas likely used for low density recreation.

On-going, existing oil-and-gas and recreation-related impacts to land use, tenure, and access are minimal, and would continue at a similar level.

4.17c2 No Action Alternative

Under the No Action alternative, on-going, existing oil-and-gas and recreation-related impacts to land use, tenure, and access are minimal, and would continue at a similar level.

4.17c3 Other Coal Mining

Coal mining activities are expected to continue to do so. Surface facilities exist for an extended period of time and alter access routes and patterns throughout that time. Ownership and control of the surface and coal estate affects that land's value during the period the surface mine facilities are in use, and affects surrounding areas by raising land values as a result of demand for residential and commercial purposes. The value of lands directly affected by surface coal mining is often reduced even after the mining is completed, despite reclamation efforts, because permissible uses are restricted and suitability for other uses may be limited. Lands downstream from closed coal facilities can be affected due to the public perception of potential negative impacts and hazards. As a result, past, present, and future coal mining activities may affect land tenure, use, and access on the USACE East Lynn Lake Project lands.

4.17c4 Oil and Gas Development

Historical natural gas development impacted land tenure on the USACE East Lynn Lake Project by encumbering both the surface estate and coal estate. Natural gas development also affected the region by

increasing associated access and infrastructure such as utilities and pipelines. While the aerial extent of the direct impact is limited, a large area is affected indirectly due to conflicts with other uses. The associated roads have increased and improved access to much of the area for hunters and recreationists. Furthermore, because oil and gas wells must be protected from mining activities, state and federal regulations require that a protective barrier of coal be maintained around any oil and gas well. As a result, past, present, and future gas development directly impacts the coal estate by precluding the removal of a large area of the coal seam surrounding any gas well.

4.17c5 Construction and Maintenance of the USACE East Lynn Lake Project

Past agricultural use consisted of small family "homesteads" including gardens, small areas of commercial crop production, and small acreages of cleared land used for pasture or hay production. These uses altered the mix of vegetation, but after establishment of the USACE Project, agricultural use ended and vegetation has essentially recovered and regrown to mature forestland described in section 3.5 (Vegetation and Forestry subsections). Because the land is now federally owned, no new agricultural use will occur.

The historical family cemeteries affect small acreages throughout the USACE East Lynn Lake Project, and were associated with the past human occupancy. These cemeteries will not increase in size in the future. Operation, maintenance, and access to the cemeteries affect land tenure because they are privately owned and in many cases there is a split estate between the surface and subsurface. Access to these cemeteries is provided by roads that are normally maintained by the state. This access must be maintained for the families who own the cemeteries. As a result, the public also will continue to have access to the cemeteries, along with the USACE lands surrounding the cemeteries.

The construction and maintenance of the USACE dam and reservoir has unquestionably had the largest impact to the region. The lands for the USACE East Lynn Lake Project were acquired by condemnation. This condemnation had obvious and significant impacts on land tenure, use, and access. The highway, along with primitive roads, had to be closed and rerouted. The condemnation created the split estate (surface and subsurface), and land tenure, use and access was further impacted when the coal was also acquired by condemnation. Now that the land is federally owned, most other uses are not allowed. At the same time, the condemnation enhanced land values because of the presence of the lake and recreation uses. The condemnation also affected downstream land values and uses by controlling flooding and nearly eliminating flood damage.

The construction, maintenance and operation of the recreation facilities, such as buildings, shelters, and the marina, have had a slight negative effect on land tenure because other conflicting uses are not allowed in those areas. Like the reservoir, the recreation facilities may have had a beneficial impact on land values and provided opportunities for other land uses on nearby private land associated with the recreation use. Those uses include seasonal or second homes, vacation homes, homes that are used in conjunction with some sort of recreation activity, stores and campgrounds that benefit from the nearby lake, and recreation facilities. These beneficial impacts on the land value will continue and could potentially expand if additional recreation facilities are constructed on the USACE East Lynn Lake Project or on nearby private lands.

Population growth in the surrounding area has a very slow and limited negative impact. As the population grows, public interest in the land uses and management increases. Population growth has limited beneficial impacts on land tenure and access as usage of the USACE East Lynn Lake Project increases and land values increase slightly. Population growth also tends to increase the use of adjacent lands for residential and commercial purposes.

4.17c6 Recreational Activities

Past recreation use and development on nearby land is limited but will increase in the future as the region continues to promote the recreation and outdoor opportunities. This increase in recreation use and development will result in the increased use of existing access, and development of new access within the USACE East Lynn Lake Project area and adjacent lands.

Past, present, and future dispersed recreation use has a slight effect on land use and access. This use is primarily temporary in that the land is "occupied" and must be managed to meet the visitor needs and expectations. Dispersed recreation does not affect land tenure.

Past and present ORV use has impacted land use and access in limited areas, but the impact can be substantial on those sites. Future ORV use is expected to affect limited areas in a similar manner. The ORV use can create and even maintain unauthorized access to sensitive areas such as cultural sites and sensitive habitat, and can preclude other land uses.

4.17c7 Logging

Historical timber harvest has altered access patterns by creating roads and trails used to remove large areas of timber. Land tenure has been impacted since the 1970s when the surface rights were acquired by the USACE. At this time, the rights–known as encumbrances–were granted to others to harvest the timber. Land value is typically reduced after timber is removed but can recover after regeneration and the completion of the rotation period, which in the vicinity of the proposed lease tracts is between 50 and 100 years. Illegal timber harvest continues to have limited impacts on the area due to loss of the timber/forest cover and soil compaction and rutting caused by timber vehicles.

4.17c8 Construction of Local Infrastructure

Utility rights-of-way such as power line ROWs must be maintained and kept clear of tall vegetation for the life of the power line, altering the mix of vegetation. New outgrants will likely continue at about the same rate as they have in the past for most uses which affects small acreages over time.

When the USACE built the East Lynn Lake Project, the highway and primitive roads, had to be closed and rerouted. Past and future ROWs add encumbrances to the land, and increase access through road construction or maintenance. Often roads and other disturbances are reclaimed and/or closed. Over time, without maintenance, these roads become impassable and the area is able to return to a near natural state. New outgrants will likely continue at about the same rate as they have in the past for most uses which affects small acreages over time.

4.17d Estimation of Combined Cumulative Effects

In combination with past, present, and reasonably foreseeable future actions, the Proposed Action or No Action Alternative will cause minor cumulative effects.

4.17e Significance Criteria

The following significance criteria have been identified for land tenure, use, and access:

- loss of other current or future uses such as access, timber harvest, utilities, gas production, or surface uses
- decrease in land or estate values due to the underground mining
- loss of existing access to other surface uses

4.17f Determination of Significance

Loss of future uses is expected to be minor. Impacts to land or real estate values are expected to be minor. Impacts to existing access or other uses are expected to be minor. As a result, all of these impacts are considered to be insignificant.

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CHAPTER 5
PUBLIC INVOLVEMENT, CONSULTATION, AND COORDINATION

5.1 PUBLIC INVOLVEMENT

The following sections provide a summary of the public involvement opportunities undertaken for the East Lynn Lake Coal Lease LUA/EIS process. In addition to the events described below, the BLM facilitated outreach efforts to media contacts that generated stories concerning the ELL EIS/LUA in *The Wayne County News* and on the *Coal Outlook* website. Even after the scoping period was over, BLM provided time for and recorded public comments and questions, which have been incorporated into this document.

Since January 2007, the BLM has posted information about the ELL EIS/LUA on this Web site: http://www.blm.gov/es/st/en/prog/east_lynn_lake_coal.html, to provide the public with project materials and create an awareness of the process.

5.1.1 Notice of Intent

On July 14, 2005, the BLM published a Notice of Intent to Prepare an LUA/EIS to Analyze Coal Lease Applications WVES-50556 and WVES-50560 (NOI) in the Federal Register (70 FR 40723-40725). The federal notice opened the scoping process, notified the public of the BLM's intent to begin the LUA/EIS process, provided project information, announced the intention to hold public meetings, and solicited public comments. Instructions in the NOI directed that written comments be sent to the BLM, Attn: John Romito, 901 Pine Street, Suite 200, Rolla, MO 65401, or online at: EastLynnLakeComments@blm.gov. The BLM has since updated correspondence to BLM, Milwaukee Field Office, Attn: Chris Carusona, 626 E. Wisconsin Ave Suite 200, Milwaukee, WI 53202.

The NOI stated that the written comments would be accepted until August 15, 2005, and that a public scoping meeting would be held in Wayne, West Virginia to provide another opportunity for the public to identify issues or concerns about the proposal.

5.1.2 Press Releases

On October 20, 2006, press releases and paid public notices regarding the East Lynn Lake Coal Lease LUA/EIS scoping process were e-mailed and/or faxed to the following West Virginia newspapers:

- *The Wayne County News*
- *The Register*
- *Bluefield Daily Telegraph*
- *Charleston Gazette*
- *Clarksburg Exponent & Telegram*
- *Times West Virginian*
- *The Huntington Herald-Dispatch*

- *Mineral Daily News*
- *The Martinsburg Journal*
- *The Dominion Post*
- *News & Sentinel*
- *The Intelligencer*
- *Williamson Daily News*

A public notice was posted daily in the *Huntington Herald Dispatch* from October 23, 2006 through November 6, 2006. Additionally, a public notice was posted in the *Charleston Gazette* every Wednesday and Sunday from October 22, 2006 through November 1, 2006. A public notice was also published in the *Wayne County News* on Friday and Saturday, November 3 and 4, 2006, preceding the meeting. Newspaper articles concerning the proposed East Lynn Lake Coal Lease LUA/EIS scoping process were published in the following media on November 3, 2006:

- *Charleston Gazette*
- *Charleston Daily Mail*
- *WVVA Channel Six News Web site*

5.1.3 Scoping

The following four scoping meetings took place in early November 2006:

- Wayne County Commissioners (WCC) meeting–November 6, 2006, held in Wayne, West Virginia
- A public scoping meeting–November 6, 2006, held in Wayne, West Virginia
- An unplanned public scoping meeting–November 7, 2006, held in Huntington, West Virginia
- Agency scoping meeting–November 7, 2006, held in Huntington, West Virginia

Two public scoping meetings were held, one on November 6, 2006, in Wayne, West Virginia at the Wayne County Community Services building (formerly housing the Wayne Senior Center) from 7 p.m. to 9 p.m. and the second on November 7, 2006, at the Ramada Inn Limited (3094 16th Street Road) in Huntington, West Virginia from 7 p.m. to 9 p.m. The Huntington meeting was held as a result of a misprint of the date, time, and location of the official public scoping meeting in the local media. This second scoping meeting was held at the date, time, and location that were misprinted in local media to ensure that everyone who was misinformed had an opportunity to participate.

During the official scoping time period, 45 comment documents were received, and 94 specific comments were identified. In addition to the written comments received, several comments were recorded during the agency scoping meeting roundtable session. Identified comments were then categorized by applicable resource and LUA/EIS section and summarized in the scoping report (BLM 2006).

5.1.3a Agency Scoping

An agency scoping meeting was held on November 7, 2006 at 10:00 a.m. at the Ramada Inn Limited in Huntington, West Virginia. The purpose of the meeting was to gather information on issues and concerns

of the agency personnel in order to focus the LUA/EIS on the primary issues. The participating agencies included: the BLM, USACE, OSM, USEPA, USFWS, WVDEP, WCC, and the WVDNR. In addition, Golder and the Applicants participated in these meetings.

The agency scoping meeting began with an open house format followed by an agency roundtable session where agency representatives discussed their concerns, questions, and information relating to the proposed lease. The discussions resulted in a determination that the NEPA process for this action should focus on the following resources:

- subsidence (Geologic Resources)
- groundwater (Water Resources)
- surface water (Water Resources)
- socioeconomics (Socioeconomic Resources)
- PETS Species (PETS Resources)

5.1.3b Public Scoping

Two public scoping meetings were held, one on November 6, 2006 in Wayne, West Virginia at the Wayne County Community Services building (formerly housing the Wayne Senior Center) and the second on November 7, 2006, at the Ramada Inn Limited (3094 16th Street Road) in Huntington, West Virginia from 7 p.m. to 9 p.m. The Huntington meeting was held as a result of a misprint of the date, time, and location of the official public scoping meeting in the local media. This second scoping meeting was held at the date, time, and location that were misprinted in local media to ensure that everyone who was misinformed had an opportunity to participate.

An open house format was used. Personnel from the BLM, USACE, OSM, Argus, Rockspring, and Golder were present to answer questions concerning each aspect of the proposed project. Completed comment forms were collected at the open house or mailed to the address provided on the comment form by December 1, 2006, the closing date of the public scoping period.

Meeting attendees at both meetings were encouraged to give written comments. Comment forms and tables were available for attendees to provide written comments, and Golder staff members were available to write down verbal comments if desired. Attendees were notified that comments needed to be received by the closing date for the comment period. The meeting held in Wayne on November 6, 2006 had the largest attendance, with approximately 15 people attending. All attendees were requested to sign in; however, it is possible that some did not. The additional meeting held in Huntington on November 7, 2006 as a result of the newspaper misprint had one attendee.

The majority of the comments indicated a concern with hydrologic impacts (Groundwater and Surface Water Resources); impacts to vegetation; impacts to PETS species; impacts to wildlife; subsidence impacts (Geologic Resources); and socioeconomic impacts. While the official scoping period spanned from October 20, 2006 until December 1, 2006, some additional comment documents were received after the completion of the scoping report that repeated some of these concerns.

The NEPA and CEQ guidelines require that all resources are analyzed during the process. This NEPA document addresses all resources, but has been focused on those issues and resources identified in both the agency and public scoping processes, listed below:

- subsidence (Geologic Resources)
- groundwater (Groundwater Resources)
- surface water (Surface Water Resources)
- socioeconomics (Socioeconomic Resources)
- vegetation (Vegetation Resources)
- wildlife (Wildlife Resources)
- PETS species (PETS Resources)

5.1.4 Socioeconomic Workshop

As part of the NEPA process, a public socioeconomic workshop was held March 27, 2007, at the Wayne County Courthouse from 6:00-8:00 p.m. Press releases and public notices were emailed and/or faxed for immediate release on March 19 and 20, 2007, to the following newspapers and news rooms: *The Wayne County News, The Register-Herald, Bluefield Daily Telegraph, Charleston Gazette, Clarksburg Exponent & Telegraph, Times West Virginian, Huntington Herald-Dispatch, Mineral News-Tribune, Martinsburg Journal, Dominion Post, News & Sentinel, The Intelligencer, News-Register, and the Williamson Daily News.* Paid advertisements to announce the meetings were presented as display ads in:

- *The Wayne County News,* on March 16, 19, 20, 21, 23, and 26, 2007
- *Huntington Herald-Dispatch,* daily March 16-27, 2007
- *Bluefield Daily Telegraph,* on March 23, 24, 26, and 27, 2007
- *Huntington Gazette* Web site: on the Sunday Weekly Calendar on March 25, 2007; and on the Daily Calendar on March 27, 2007.

In addition to the announcements made to the list identified above, about 150 announcements were mailed on March 20, 2007, addressed to businesses and public and government agencies.

Approximately 31 people attended the socioeconomic meeting at the Wayne County Courthouse. Sixteen members of the public attended, including Wayne County commissioners, along with fifteen representatives of the Cooperating Agencies or Applicants. Specific management issues and concerns were raised during this workshop, including the following:

- potential impacts associated with the proposed lease and underground mining of coal
- conerns about the impact on recreational activities such as fishing at East Lynn Lake, which received 531,157 visitors in 2006 (Davis 2007)
- the desire for social and economic prosperity to be realized in Wayne County as a result of the proposed lease and mining

5.1.5 Draft Land Use Analysis/Draft Environmental Impact Statement

A Notice of Availability (NOA) announcing the availability and means of obtaining the *East Lynn Lake Coal Lease Draft LUA/Draft EIS (DLUA/DEIS)* was published in the *Federal Register* by the BLM on June 16, 2008 (73 FR 34035), and the USEPA on June 27, 2008 (73 FR 36503) with an amended notice on July 3, 2008 (73 FR 38204).

The 90-day public review and comment period officially began with the publication of the USEPA NOA, and was scheduled to end September 24, 2008 (73 FR 36503). The public comment period was subsequently extended by the BLM in another *Federal Register* announcement on September 9, 2008, for an additional 45 days, officially ending on November 10, 2008 (73 FR 52411).

During the public comment period the BLM held a public hearing concerning the DLUA/DEIS. This hearing was held at the Wayne Town Hall, on July 31, 2008. This *Final Land Use Analysis and Final Environmental Impact Statement for the East Lynn Lake Coal Lease* (*FLUA/FEIS*) has been modified based on both the comments received from the public at the BLM hearing and written comments received via e-mail and U.S. postal service. Appendix J presents the public comments, the hearing transcript, agency review comments, congressional inquiries, and the BLM responses to the comments.

5.1.6 Protest Period Following Issuance of the Final Land Use Analysis/Final Environmental Impact Statement

BLM's planning regulations (43 CFR 1610.5-2) provide that any person who participated in the planning process for the FLUA/FEIS and has an interest which is or may be adversely affected by the planning decisions may protest approval of the decision within 30 days from date the USEPA publishes the Notice of Availability in the *Federal Register.* Detailed procedures are described in the Dear Reader letter at the front of this document along with writer aides provided as attachments #1 and #2. E-mailed and faxed protests will not be accepted as valid protests unless the protesting party also provides the original letter by either regular or overnight mail postmarked by the close of the protest period.

The BLM Director will make every attempt to promptly render a decision on each protest. The decision will be in writing and will be sent to the protesting party by certified mail, return receipt requested. The decision of the BLM Director shall be the final decision of the Department of the Interior. Upon resolution of all land use plan protests, the BLM will issue an Approved LUA and Record of Decision (ROD). The Approved LUA and ROD will be mailed or made available electronically to all who participated in the planning process and will be available to all parties at http://www.blm.gov/es/st/en/prog/east_lynn_lake_coal.html or by mail upon request at Bureau of Land Management, Milwaukee Field Office, Attention: Mr. Carusona, 626 E. Wisconsin Ave., Suite 200, Milwaukee, WI 53202 or telephone 414-297-4463.

Unlike land use planning decisions, implementation decisions are not subject to protest under the BLM planning regulations, but are subject to an administrative review process, through appeals to the Office of Hearings and Appeals (OHA), Interior Board of Land Appeals (IBLA) pursuant to 43 CFR, Part 4 Subpart E. Implementation decisions generally constitute the BLM's final approval allowing on-the-ground actions to proceed. Where implementation decisions are made as part of the land use planning process, they are still subject to the appeals process or other administrative review as prescribed by

specific resource program regulations once the BLM resolves the protests to land use planning decisions and issues an Approved LUA and ROD. The Approved LUA and ROD will indicate which alternative is selected and with what conditions, if any. The implementation decisions made in the plan may be appealed to the Office of Hearing and Appeals.

5.1.7 Governor's Consistency Review Appeal Process Following Issuance of the Final Land Use Analysis/Final Environmental Impact Statement

In addition to a 30-day protest period, the BLM must also provide a 60-day review period to the Governor of the state in which the LUA is being proposed to ensure consistency with state and local plans, policies, and programs. The protest period and the Governor's review period occur simultaneously. Any responses from a Governor on consistency must be resolved before the BLM issues an ROD.

If the Governor does not respond within the review period, the BLM can assume that the proposed land use plan (this LUA) decisions are consistent with state and local plans, policies, and programs [43 CFR 1610.3-2(e)]. If the Governor recommends changes in the proposed plan that were not raised during the public participation process, the State Director shall provide the public with an opportunity to comment on the recommendations [43 CFR 1610.3-2(e)]. This public comment opportunity will be offered for 30 days and may coincide with the 30-day comment period for the notice of significant change. If the State Director does not accept the Governor's recommendations, the Governor has 30 days to appeal in writing to the BLM Director [43 CFR 1610.3-2(e)].

5.1.8 Process Following Issuance of a Record of Decision

Once the ROD is signed, and if the Proposed Action is selected, a competitive lease sale for the federal coal tracts would be held and a lease would be issued. At least 30 days prior to the lease sale a notice of sale would be published in the *Federal Register* in accordance with 43 CFR 3422.2.

In accordance with 43 CFR 3422.1, the BLM presented the fair market value (FMV) and maximum economic recovery (MER) of the lease tracts in the RFDS. The public was solicited to provide comments on the FMV and the MER during the public comment period on the DLUA/DEIS and at the public hearing held on July 31, 2008 in Wayne, West Virginia. No substantive comments on the FMV or MER were received.

The BLM is not authorized to accept any bid that is less than the FMV. Minimum bids shall be set on a regional basis and may be expressed in either dollars-per-acre or cents-per-ton. In no case shall the minimum bid be less than $100 per acre or its equivalent in cents-per-ton (34 CFR 3422.1)

The lessee or lessees will have to submit a mine plan to the OSM for approval prior to mining. This mine permit application would undergo detailed review by state and federal agencies as part of the approval process. The OSM, the BLM, and other federal agencies review the permit application package to ensure it complies with the terms of the coal lease, the MLA, NEPA, and other federal laws and their attendant regulations. Regulatory compliance and monitoring requirements are shown on table 2.1-1.

5.2 CONSULTATION

5.2.1 Wayne County Commissioners Consultation

In an effort to involve local community stakeholders, a County Commissioners' meeting was held on November 6, 2006 at the Wayne County Courthouse in Wayne, West Virginia. The BLM, Golder, and the Applicants were present at the meeting. During the meeting, BLM provided an overview of the LUA/EIS process and explained the status of the East Lynn Lake Coal Lease LUA/EIS.

5.2.2 PETS Species Consultation

Section 7 of the *Endangered Species Act* (ESA) requires a federal agency to evaluate a proposed action for compliance with the ESA. Section 7(a)(2) states that each federal agency shall, in consultation with the Secretary, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

By regulation, a biological assessment is prepared for "major construction activities" considered to be federal actions significantly affecting the quality of the human environment as referred to in the NEPA (42 USC 4321 et seq.). A major construction activity is a construction project or other undertaking having similar physical impacts, which qualify under NEPA as a major federal action. Major construction activities include dams, buildings, pipelines, roads, water resource developments, channel improvements, and other such projects that modify the physical environment and that constitute major federal actions. As a rule of thumb, if an environmental impact statement is required for the proposed action and construction-type impacts are involved, it is considered a major construction activity. A biological assessment is required if listed species or critical habitat may be present in the action area.

The BLM does not manage any land surface in West Virginia, so the BLM has no sensitive species list for West Virginia. The BLM typically uses USFWS information, along with its own sensitive species list and any state agency information received, such as the NHP list, to identify sensitive species in a given area.

On December 15, 2006, the BLM submitted letters to the USFWS and WVDNR requesting lists of PETS species within the proposed lease tracts.

On January 10, 2007 the BLM received a response letter from the USFWS indicating that because no surface disturbance would occur, no federally listed species would be impacted by the proposed project. Subsequently, the BLM requested any other available information on reported occurrences of PETS species in the vicinity of the proposed lease tract (Wendlandt 2007b). During the conversation, USFWS indicated that the single species that might be impacted is the Indiana bat (*Myotis sodalis*).

On February 9, 2007, the BLM received the USFWS table *Federally Listed Endangered and Threatened Species in West Virginia (revised October 2006)* (Johnson-Hughes 2007). This table lists 20 species by scientific or taxonomic name, common name, status, and geographic distribution. None of the 20 listed species, including the Indiana bat, have been reported in Wayne County, West Virginia. However, potential summer forested habitat for the Indiana bat exists throughout West Virginia (USFWS and others 2007).

Responses to the request for lists of PETS species are valid for six months after issuance. On June 5, 2007, approximately six months after the initial request for a list of PETS species, the BLM submitted a second letter to the USFWS. In this letter, the BLM included a revised description of the Proposed Action and RFDS, noting the potential for surface disturbance as a result of emergency rescue operations, additional ventilation shafts, exploration drilling, or localized subsidence. On June 19, 2007, the BLM submitted additional information to the USFWS, indicating that a maximum of 20 acres of surface disturbance over a 10-year period could occur as a result of:

- surface subsidence and subsequent reclamation,
- groundwater impacts that could affect surface water, wells, or springs,
- surface disturbance that would result from emergency rescue operations,
- future need for ventilation shafts, and
- exploration drilling.

On July 23, 2007, the BLM received the USFWS's response dated July 10, 2007, which cited the *Coal Mining in West Virginia: Guidelines for Protecting the Indiana Bat (Myotis sodalis)* dated January 2007 (USFWS 2007c). The letter (Chapman 2007b) applies these guidelines to the East Lynn Lake LUA/EIS by stating that:

> …forested habitat removal up to 40 acres associated with mining activities has been determined to not affect Indiana bats when the activities occur outside of known winter or summer habitat. This project will occur outside of known Indiana bat winter or summer habitat.
>
> Based on this information, the USFWS determined that federally listed species would not be affected by the proposed leasing, and that no further consultation under ESA Section 7 (a)(2) is required.

The WVDNR manages lands in the state, but the agency does not have an official list of special status species. The agency does maintain a database of rare, threatened and endangered (RTE) species occurrence records, and a list of Species of Greatest Need of Conservation (WVDNR 2003). On December 27, 2007, the BLM received a response letter from the WVDNR stating that their RTE species occurrence records (WVDNR 2007) indicated that two plant species–creeping cucumber (*Melothria pendula*) and little-headed nutrush (*Scleria oligantha*)–were located in the vicinity of the proposed lease tracts. On table 3.7-2 both plant species are classified by the Heritage Network Ranking System S1 and G5 (as defined in table 3.7-1) indicating that they are both at least locally rare. The Indiana bat is included on the WVDNR Species of Greatest Need of Conservation list for mesophytic forest and the list for oak/hickory and dry/mesic oak forest (WVDNR 2003).

5.2.3 Cultural Resources Consultation

On July 13, 2007, the BLM submitted the Class I Overview (Anslinger and others 2007) to the West Virginia State Historic Preservation Office (WVSHPO), requesting concurrence that the project would have no effect on Historic Properties under 36 CFR 800.

On August 27, 2007 the BLM received a written response (reference FR#07-97-WA-2, dated August 20, 2007) from the West Virginia Deputy State Historic Preservation Officer, concurring with the opinion of

no effect on historic properties. The WVSHPO considered the undertaking's potential to affect archaeological as well as architectural resources which may be may be eligible for listing on the National Register. The Class I Cultural Resources Overview completed on behalf of BLM, was determined sufficient for their review.

The West Virginia State Historic Preservation Office (WVSHPO) did, however, ask the BLM to be mindful of subsidence underlying family cemeteries in and around the planning area. This concern has been raised previously and subsidence issues are considered in other sections of this EIS. There are no current concerns with subsidence underlying the known cemeteries within the planned areas of potential effect.

If the Proposed Action is selected and the RFDS is implemented, and if surface activities are proposed, the OSM would re-initiate consultation with the WVSHPO, in compliance with regulations (36 CFR 800) pertaining to Section 106 of the *Historic Preservation Act*.

5.2.4 Tribal Consultation

At this time, West Virginia has no federally recognized tribes or Native American traditional areas (Anslinger and others 2007). The BLM initiated the Native American consultation process by contacting seven historically affiliated Tribal Governments by letter:

- The Chairman of the Shawnee Tribe
- The President of the Delaware Nation
- The Chief of the Eastern Shawnee Tribe of Oklahoma
- The Principal Chief of the Eastern Band of Cherokee Indians
- The Governor of the Absentee Shawnee Tribe of Oklahoma
- The Principal Chief of The Cherokee Nation
- The Chief of the United Keetoowah Band of Cherokee Indians.

These letters (Horton 2006) informed the Tribes about the proposed project in West Virginia such as where the project is located (including map), that the proposed leasing and associated underground mining would not create any new surface disturbance. The letters also described the content of the upcoming East Lynn Lake Coal Lease LUA/EIS. The letters invited the individual Tribes to share concerns, questions, or comments by contacting the BLM-Eastern States Cultural Heritage Program Leader and Tribal Coordinator. The letters also stated that the BLM would contact the Tribes by telephone in early January 2007 about further consultation. The BLM received a stamped response stating “no objections, no comments” from the United Keetoowah Band of Cherokee Indians (Ferone 2007c). Mr. Ferone, Cultural Heritage Leader with the BLM, also received a voicemail message left on his answering machine on behalf of the Delaware Nation stating that the Delaware Nation, with no interest in the East Lynn Lake Coal Lease LUA/EIS, wished to be removed from the BLM’s mailing list (Ferone, 2007b).

After the BLM issued the initial letters to the tribes, the BLM followed up by calling each tribe (Ferone 2007c). In addition to the call, the BLM faxed additional copies of the initial consultation letters with project area maps. The BLM received no interest or written correspondence (Ferone 2007c).

If the Proposed Action is selected and the RFDS is implemented, and if surface activities are proposed, the BLM would re-initiate consultation with the Tribes, in compliance with regulations (36 CFR 800) pertaining to Section 106 of the *Historic Preservation Act* (Ferone 2008).

5.2.5 General Conformity Analysis for Air Quality

The BLM conducted an air conformity analysis, approved January 30, 2008, as required by 40 CFR 93. Under these regulations, an air conformity analysis is required for all federally-approved projects that are proposed in areas classified as "nonattainment" or "maintenance" areas under the *Clean Air Act* demonstrate that the proposed action would not detrimentally increase air pollution for the region.

For the East Lynn Lake Coal Lease LUA/EIS, Wayne County (or the regional designation) is currently a nonattainment area for $PM_{2.5}$ pollution. The Proposed Action would extend the life of the Applicants' existing, adjoining mines and associated facilities, including the coal preparation plants. Neither Applicant has plans for expansion or replacement of existing preparation plants. Under this condition, the Proposed Action qualifies for exclusion under the provisions of 40 CFR 93.153:

> (c) The requirements of this subpart shall not apply to the following Federal actions:
>
> > (2) Actions which would result in no emissions increase or an increase in emissions that is clearly de minimus:
> > (ii) Continuing and recurring activities such as permit renewals where activities conducted will be similar in scope and operation to activities currently being conducted.

For each Applicant's facility, existing calculated or measured PM_{10} emissions have been converted to $PM_{2.5}$ emissions using the USEPA emission factors for primary crushing and screening and for fugitive emissions (particularly unpaved roads). Assuming no increase in preparation plant activity, the proposed coal mining and processing would not result in additional emissions that would exceed the de minimus value of 100 tons per year [40 CFR 93, Section 153, Paragraph (b)].

5.2.6 List of Agencies, Organizations, and Persons to Whom Copies of the Statement are Sent

The original mailing list for the East Lynn Lake Coal Lease LUA/EIS included approximately 80 parties. This list represented all individuals, agencies, or groups who have expressed interest in this or similar projects. The mailing list has been continuously revised by either adding or deleting individuals who did or did not respond (either verbally or in writing) to the scoping request for comments, legal notices, NOI, requested a copy of the East Lynn Lake Coal Lease DLUA/DEIS, or provided comments during the scoping process. A listing of recipients of the DLUA/DEIS is provided as table 5.2-1.

5.2.7 Coordination

As defined in the MLA and the WRDA of 1999, the BLM is the decision-making authority regarding the leasing of the federal coal that lies under the proposed lease tracts. The USACE is the SMA for the proposed lease tracts. Consequently, the BLM, in cooperation with the USACE, the OSM, and the WVDNR, has prepared this FLUA/FEIS to address proposed leasing of the federal coal in the

Coalburg/Winifrede seam that lies under these tracts. The BLM is the lead federal agency, and the USACE, the OSM, and the WVDNR are Cooperating Agencies. The BLM will use the information presented in this FLUA/FEIS to determine where extended coal production may occur without unduly damaging wildlife, recreation, or other resources and resource uses; and to decide whether to consent to leasing of the federal coal.

The BLM has the regulatory authority to address coal lease applications (coal lease sales) on federal mineral reserves. The BLM serves as the lead federal agency in the preparation of this FLUA/FEIS. As part of the land use analysis process [43 CFR 3425.4(a)(1)], the BLM held a hearing on the *East Lynn Lake Coal Lease Draft LUA/Draft EIS (DLUA/DEIS)*. Comments received during the BLM hearing, along with the official minutes of the BLM hearing are presented in appendix J. In response to an application for leasing the federal coal resource in the Coalburg/Winifrede seam that lies under the nine proposed lease tracts, the BLM will determine the maximum economic recovery (MER) and fair market value (FMV) of the coal resource that lies under the proposed lease tracts. In consultation with the USACE, the responsible official for the BLM will review the *Final LUA/Final EIS for the East Lynn Lake Coal Lease*, along with the results of the MER/FMV, to decide 1) whether or not to offer the federal coal lying under the nine USACE tracts for competitive leasing, and 2) to identify any necessary terms, conditions, and stipulations.

If the Proposed Action is selected and the leases for the proposed lease tracts are issued, then in accordance with SMCRA, the OSM would provide recommendations to the Secretary of the Interior regarding approval, disapproval, or conditional approval of mine plans on lands contained within federal lease areas. The responsible official for the OSM would review the proposed mine plan associated with the *Final LUA and Final EIS for the East Lynn Lake Coal Lease*, and would receive input from the BLM.

If it is determined that there may be surface impacts resulting from mining beneath the proposed lease tracts, then the OSM, with input from the USACE, would be responsible for providing recommendations to the Secretary of the Interior concerning the issuance of findings as to whether or not the proposed lease and mining areas contain significant recreational, timber, economic or other values that may be incompatible with the proposed mining activities. These decisions and processes will be made in a cooperative, coordinated effort between agencies, utilizing the NEPA documents and processes as the primary decision making instruments, for each decision.

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CHAPTER 6
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CHAPTER 7
BIBLIOGRAPHY

Abrams, Marc D. 1992. Fire and the Development of Oak Forests**:** ***BioScience*** v. 42 (5:May) : pp. 346-353.

Acid Drainage Technology Initiative (ADTI). 2000. *Prediction of Water Quality at Surface Coal Mines, Acid Drainage Technology Initiative,* edited by R.L.P. Kleinmann. Morgantown, WV: The National Mine Land Reclamation Center.

Adams-Russell Consulting. 2004. *Social Assessment: Clearwater National Forest and Nez Perce National Forest Final Report,* prepared for the U.S. Forest Service, and dated April 2004. Online: http://www.fs.fed.us/cnpz/forest/documents/social/Final_Clearwater4_20.pdf. (accessed February 23, 2007).

American Geological Institute. 1997. *Dictionary of Mining, Mineral, and Related Terms,* 2nd edition. Alexandria, VA: American Geological Institute in cooperation with the Society for Mining, Metallurgy, and Exploration.

American National Standard Institute (ANSI). 1983. *Specification for Sound Level Meters.* (R2006).

ANSI. 1993. *Qualities and Procedures for Description and Measurement of Environmental Sound–Part 3* (S12.9-1993/Part 3).

American Public Transportation Association. 2003. *West Virginia transit links.* Online: http://www.apta.com/links/state_local/wv.cfm#A3. (accessed on March 9, 2007).

Anslinger, C. Michael. 2007. *Personal* communication (e-mail) between Mike Anslinger (CRAI) and Terry Reed (Project Manager, Golder), regarding: sites eligible for the National Register of Historic Places. June 20, 2007.

Anslinger, C. Michael, William D. Updike, and James Kompanek. 2007. *Class I Cultural Resources Overview of the East Lynn Lake Coal Lease Stonewall District, Wayne County, West Virginia* . Confidential Report submitted to Golder Associates Inc., Lakewood Colorado, and dated March 9. Hurricane, WV: Cultural Resource Analysts, Inc., 119 p.

Appalachian Regional Commission (ARC). 2006. *Regional Data and Research Reports.* Online: http://www.arc.gov/index.do?nodeId=57. (accessed from January–March, 2007).

Arch Coal, Inc. 2007. *Annual Report pursuant to section 13 or 15(D) of the Securities Exchange Act of 1934 for the fiscal year ended December 31, 2006* (Commission File Number: 1-13105). Online: http://google.brand.edgar-online.com/ (accessed January 2008). Figure used by permission.

Argus Energy WV, LLC (Argus). 1992-2002. *Permit U-5023-92, Violations.*

Argus. 2003. *Blue Book, MR 19A Transfer, Permit U-5023-92 Pen Coal Corporation to Argus Energy WV, LLC.*

_____. 2005. Geophysical logs.

_____. 2006a. CAD file supplied by Argus: [east_lynn_general_rev4_2.dwg], dated 09/26/06.

_____. 2006b. *Argus Chemistry* data 1985-2006 (spreadsheet only).

_____. 2007. *Drawing–Protective Barrier Plan*, prepared for the BLM Reasonably Foreseeable Development Scenario (RFDS), received February 7, 2007.

Ashton, Kenneth. 2007. Personal communication (phone conversation) between Kenneth Ashton (Coal Geologist, West Virginia Geological and Economic Survey) and Annette Moltzan (Project Geologist, Golder) regarding: landslides and geologic map. August 28, 2007.

Aukerman, Robert, Glenn Haas, Vernon Lovejoy, and Darrell Welch. 2004. *Water Recreation Opportunity Spectrum (WROS) Users' Guidebook.* Lakewood, CO: U.S. Bureau of Reclamation, Office of Program and Policy Services. Online: http://www.usbr.gov/pmts/planning/wros/ (accessed April 2007).

Babcock, Clarence O. and Verne E. Hooker. 1977. *Results of Research to Develop Guidelines for Mining Near Surface and Underground Bodies of Water.* (Information Circular 8741). Washington, DC: U.S. Bureau of Mines.

Bailey, Robert G. (compiler). 2005. *Descriptions of the Ecoregions of the United States,* 2nd ed. revised and expanded, with separate map at 1:7,500,000. (Misc. Pub. 1391 rev.). Washington, DC: U.S. Forest Service, 108 p.

Barton, Mark. 2007a. Personal communication (e-mail) between Mark Barton (Chief Engineer, Rockspring Development Inc.) and Bindi Patel (Project Environmental Planner, Golder Associates Inc.) regarding: Rockspring Development employment and financial information. March 23, 2007.

_____. 2007b. Personal communication (phone conversation) between Mark Barton (Chief Engineer, Rockspring Development, Inc.) and Annette Moltzan (Project Geologist, Golder) regarding: abandoned and inactive mine locations, and mining under streams. September 18 and 26, 2007.

_____. 2007c. Personal communication (e-mail) between Mark Barton (Chief Engineer, Rockspring Development, Inc.) and Annette Moltzan (Project Geologist, Golder) regarding: landslides and other geologic information. August 24, 2007.

_____. 2007d. Personal communication between Mark Barton (Chief Engineer, Rockspring) and Paul Williams (Groundwater Resource Specialist, Golder) regarding: completion of Evans, Hale, and White well. November 1, 2007.

_____. 2007e. Personal communication (e-mail) between Mark Barton (Chief Engineer,Rockspring Development, Inc.) and Elizabeth Duvall (Project Co-manager, Golder) regarding: existing air emissions. September 20 and October 3, 2007.

_____. 2007f. Personal communication (telephone) between Mark Barton (Chief Engineer, Rockspring) and Elizabeth Duvall (Project Co-manager, Golder) regarding: use and storage of hazardous materials on existing mines. November 2, 2007.

_____. 2007g. Personal communication (telephone) between Mark Barton (Chief Engineer, Rockspring) and Elizabeth Duvall (Project Co-manager, Golder) regarding: existing storage facilities, and proposed storage facilities necessary for continuation of existing operations, September 20, 2007.

_____. 2007h. Personal communication (e-mail) between Mark Barton (Chief Engineer, Rockspring) and Elizabeth Duvall (Project-co Manager, Golder) regarding: reasonably foreseeable future mining resulting from proposed mining. November 2, 2007.

_____. 2007i. Personal communication (phone conversation) between Mark Barton (Chief Engineer, Rockspring Development Inc.) and Elizabeth Duvall (Project Co-manager, Golder) regarding: oil and gas and utilities. April 29, 2007.

Baumgardner, Terry. 2007. Personal communication (phone conversation) between Terry Baumgardner (Sudden Link Cable Co.) and Elizabeth Duvall (Project Co-manager, Golder) regarding: utilities. May 1, 2007.

BBER, S*ee* Hammond, George W. 2005

BEA, *See* Bureau of Economic Analysis

Beverly, J. and M. Gumbert. 2004. Indiana bats in West Virginia, a review in *Proceedings of Indiana Bat and Coal Mining: A Technical Interactive Forum November 16-18, 2004, Holiday Inn Hurstbourne, Louisville, Kentucky*, edited by Kimery C. Vories and Anna Harrington. Alton, IL: U.S. Office of Surface Mining, pp. 139-148. Online: http://www.mcrcc.osmre.gov/PDF/Forums/Batpercent20Indiana/TOC.pdf (accessed May 1, 2007).

Bhattacharya, Swapan and Madan M. Singh. 1985. *Development of subsidence damage criteria: final report*, performed for the U.S. Office of Surface Mining, Reclamation and Enforcement. (Available NTIS PB90147356). Westmont, IL: Engineers International, Inc., 225 p.

Blackburn, Tim W. 1997. Letter Report regarding Pen Coal Corporation's Proposed East Lynn Lake Project, addressed to Mr. James Grigsby, Manager–Mine Development, Pen Coal Corporation, and dated January 31, 1997. Stanville, KY: TEE Engineering Co., Inc.

Blake, Bascombe M., Jr. 2007a. Personal communication from Bascombe Blake (West Virginia Geological and Economic Survey) to Ana Vargo (Project Geologist, Golder) regarding: regarding Paleontological resource protection in West Virginia. January 26, 2007.

_____. 2007b. Personal communication from Bascombe Blake (West Virginia Geological and Economic Survey) to Ana Vargo (Project Geologist, Golder) regarding: Coalburg coal fossils. March 2, 2007.

Blake, Bascombe M., Jr., Aureal T. Cross, Cortland F. Eble, William H. Gillespie, and Hermann W. Pfefferkorn. 2002. Selected plant megafossils from the Carboniferous of the Appalachian Region, eastern United States: Geographic and stratigraphic distribution in *Carboniferous and Permian of the World XIV ICCP Proceedings,* edited by L. V. Hills, C. M. Henderson and E. W. Bamber. (Memoir 19). Calgary, Alberta: Canadian Society of Petroleum Geologists, p. 259-335.

Blake, Bascombe M.,Jr., Alan F. Keiser, and Charles L. Rice. 1994. Revised stratigraphy and nomenclature for the Middle Pennsylvanian Kanawha Formation in southwestern West Virginia, in ***Elements of Pennsylvanian Stratigraphy, Central Appalachian Basin,*** edited by C.L. Rice**.** (Special Paper 294) Boulder CO: Geological Society of America, pp. 41- 53.

Blake, Blake M. Jr., R.L. Martino, W.C. Grady, and C.F. Eble, 1998. *Coal geology, paleobotany and regional stratigraphy of the Middle Part of the Kanawha Formation, southern West Virginia*. (Open File 9803). Morgantown, WV: West Virginia Geological and Economic Survey, p. 41-56.

BLM, *See* Bureau of Land Management

Borchers, J. W., T. A. Ehlke, M. V. Mathes, Jr., and S. C. Downs. 1991. *The effects of coal mining on the hydrologic environment of selected stream basins in southern West Virginia.* (Water Resources Investigation 84-4300). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/wri/wri844300.

Brown, M. L. and R. G. Brown. 1984. *Herbaceous Plants of Maryland.* Baltimore, MD: Port City Press, 1125 pp.

Brown, Zack. 2007. Personal communication (phone call) between Zack Brown (District Fisheries Biologist, WVDNR Fisheries) and Richard Greer (Senior Consultant, Golder) regarding: fisheries information for ELL and its tailwaters. May 9, 2007.

Bruhn and others. 1983. Damage to structures above underground coal mines in the northern Appalachian coalfield, in *Proceedings of the First International Conference on Stability in Underground Mining, held in Vancouver, Canada, August 16-18, 1982*, edited by C.O. Brawner. New York: Society of Mining Engineers (AIME).

Bureau of Economic Analysis (BEA). 2006. "Regional Accounts Data, Annual State Personal Income" Online: www.bea.gov/bea/regional/spi (accessed 31 January 2006).

BEA. 2007a. BEARFACTS http://www.bea.gov/bea/regional/bearfacts/ (accessed March 2007).

_____. 2007b. *State Annual Personal Income: Personal current transfers detail.* (table SA35) Online: http://www.bea.gov/bea/regional/spi/ (accessed March 2007).

Bureau of Land Management (BLM). 1986a. *Coal Management.* (BLM Manual Section 3400, MTS release 3-146).

BLM. 1986b. *Competitive Leasing*. (BLM Manual Section 3420, MTS release 3-147).

_____. 1986c. *Competitive Coal Leasing.* (BLM Handbook 3420-1, MTS release 3-148).

_____. 1998a. *Paleontological Resource Management*. (BLM Manual Section MS-8270). Washington, DC: U.S. Bureau of Land Management, 15 p. Online: http://www.blm.gov/heritage/docum/8270_mnl.pdf (accessed June 8, 2007).

_____. 1998b. *General Procedural Guidance for Paleontological Resource Management.* (BLM Handbook H-8270-1) dated 7/13/1998. Washington, DC: U.S. Bureau of Land Management, 33 p. Online: http://www.blm.gov/heritage/docum/8270-hbk.pdf. (accessed June 8, 2007).

_____. 2003. *Visual Resource Management System*. [Internet Web site]: http://www.blm.gov/nstc/VRM/. (accessed April 9-10, 2007).

_____. 2004. *Manual on Identifying and Evaluation Cultural Resources* (BLM Manual Section 8110). Washington, DC: U.S. Bureau of Land Management, Online: http://www.blm.gov/nhp/efoia/wo/manual/8110.pdf (accessed October 19, 2007).

_____. 2006. *East Lynn Lake Coal Lease Scoping Report,* prepared for the BLM by Golder Associates Inc. Rolla MO: BLM-Eastern States, Milwaukee.

_____. 2007a. *Reasonably Foreseeable Development Scenario (RFDS),* dated April 19, 2007 and revised September 12, 2007. Milwaukee, WI: BLM Eastern States.

_____. 2007b. *Reasonably Foreseeable Development Scenario (RFDS) for Private Oil and Gas Ownership Associated with Lands of the East Lynn Lake Project Area,* dated June 8, 2007. *(Attachment 1 to the Reasonably Foreseeable Development Scenario).* Milwaukee, WI: BLM Eastern States.

_____.2007c. *Memorandum of Understanding between [BLM] and the West Virginia Division of Natural Resources for Preparation of Environmental Impact Statement for Coal Leasing and Coal Exploration Applications at East Lynn Lake, Wayne County, West Virginia* (MOU-BLM-ES-030-07-02), signed July 2007. Milwaukee, WI: BLM Milwaukee Field Office.

_____. 2007d. *East Lynn Lake Geology and Minerals Phase I Preliminary Subsidence Analysis (PSA),* prepared for the U.S. Bureau of Land Management by Golder Associates Inc., dated May 10, 2007. Milwaukee, WI: BLM Eastern States.

_____. 2007e. *East Lynn Lake Coal Lease Land Use Analysis and Environmental Impact Statement: Analysis of the Management Situation* (AMS) prepared for the BLM by Golder Associates Inc. and dated June 23, 2007. Milwaukee, WI: BLM Eastern States.

_____. 2007f. *East Lynn Lake Coal Lease Land Use Analysis and Environmental Impact Statement: Data Analysis and Adequacy Report* (DAAR), prepared for the BLM by Golder Associates Inc.and dated July 17, 2007. Milwaukee, WI: BLM Eastern States.

_____. 2007g. *East Lynn Lake Coal Lease Land Use Analysis and Environmental Impact Statement: Alternatives Technical Memo,* prepared for the BLM by Golder Associates Inc. and dated July 18, 2007. Milwaukee, WI: BLM Eastern States. BLM. 2007h. *What we do: Endangered, Threatened, and Special Status Plants and Animals.* U.S. Department of the Interior / Bureau of Land Management / Idaho Web site. Online: http://www.id.blm.gov/whatwedo/spec_status.htm.

_____. 2008a. *Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands*. (BLM Instruction Memorandum IM 2008-009). Washington, DC: U.S. Bureau of Land Management.

_____. 2008b. *East Lynn Lake Coal Lease; Socioeconomic baseline assessment and socioeconomic impact analysis* prepared for the BLM by Golder Associates Inc. (EIS-ES-030-2008-0004). Milwaukee, WI: BLM Eastern States.

_____. 2008c. *Reasonably Foreseeable Development Scenario (RFDS),* revised February 14, 2008. Milwaukee, WI: BLM Eastern States.

_____. 2009. *Reasonably Foreseeable Development Scenario (RFDS),* dated April 19, 2007 and revised September 12, 2007. February 14, 2008, and March 18, 2009. Milwaukee, WI: BLM Eastern States.

Campbell, Marius Robinson. 1900. *Huntington folio, West Virginia-Ohio.* (Folios of the Geologic Atlas). Washington, DC: U.S. Geological Survey.

Carrico, Anthony. 2007. Personal communication (e-mail) between Anthony Carrico (West Virginia State Fire Marshal Office) and Bindi Patel (Project Environmental Planner, Golder), dated March 9, 2007.

Carusona, Chris. 2007a. Personal communication (e-mail) between Chris Carusona (Environmental Planner/Coordinator, BLM) and Bindi Patel (Project Environmental Planner, Golder), dated March 9, 2007.

_____. 2007b. Personal communication (phone call) between Chris Carusona (Environmental Planner/Coordinator, BLM) and Elizabeth Duvall (Project Co-manager, Golder). May 4, 2007.

Chapman Thomas R. 2007a. Letter from Mr. Thomas R. Chapman (USFWS) to Mr. Aaron G. Horton (Field Manager, BLM). regarding: East Lynn Coal Lease, Wayne County, West Virginia, dated January 10, 2007. Elkins, WV: U.S. Fish and Wildlife Service.

_____. 2007b. Letter from Mr. Thomas R. Chapman (USFWS) to Mr. Terry A. Reed (Project Manager, Golder), regarding: East Lynn Lake Coal Lease, Surface Disturbance Correction, Wayne County, WV, dated July 12, 2007. Elkins, WV: U.S. Fish and Wildlife Service.

Childs, Randall A. 2005. *West Virginia's Forest; Growing West Virginia's Future*. Morgantown, WV: West Virginia University, Bureau of Business and Economic Research. Online: http://www.wvforestry.com/Economic%20Impact%20Study.pdf (accessed January 2008).

City of Huntington. 1999. City of Huntington Fire Department. [Internet Web site]: http://www.cityofhuntington.com/Fire_Department/index.html (accessed on March 4, 2007).

Clark, Roger N. and George H Stankey. 1979. *The Recreation Opportunity Spectrum: A framework for planning, management, and research*. (General Technical Report PNW-98). Seattle, WA: U.S. Forest Service, Pacific Northwest Forest and Range Experiment Station. Online: http://www.treesearch.fs.fed.us/pubs/6014 (accessed April 2007).

Colorado Natural Heritage Program (CNHP). 2007. *About the Heritage Network Ranking System.* [InternetWeb site]: Fort Collins, CO: Colorado State University. Online: http://www.cnhp.colostate.edu/heritage.html (accessed May 10, 2007).

Compliance Monitoring Labs, Inc. 2005. *Bat Species Inventory of Pretty Branch Surface Mine, Lincoln County, West Virginia*. Prepared for Argus Energy WV, LLC., dated August 29.

_____. 2006a. *Bat Species Inventory of Copley Trace No. 2 Surface Mine (S-5026-98) Amendment No. 2, Lincoln and Mingo Counties, West Virginia.* Prepared for Argus Energy WV, LLC., dated August 28.

_____. 2006b. *Bat Species Inventory of Rollem Fork No. 2 Extension (S-5025-00) Wayne and Lincoln Counties, West Virginia.* Prepared for Argus Energy WV, LLC., dated August 29.

_____. 2006c. *Bat Species Inventory of Jim's Branch Surface Mine, Lincoln and Mingo Counties, West Virginia.* Prepared for Argus Energy WV, LLC., dated August 30.

_____. 2006d. *Bat Species Inventory of East Fork South Surface Mine, Wayne and Lincoln Counties, West Virginia.* Prepared for Argus Energy WV, LLC. October 3.

Cramer, Cindy. 2007. Personal Communication (e-mail) from Cindy Cramer (Commissioner's Office, West Virginia Department of Transportation) to Ana Vargo (Project Geologist, Golder) regarding: West Virginia accident rate per million miles traveled. June 5, 2007.

Cusick, A. W. 1983. *Trichomanes boschianum, Sturm, Appalachian Filmy Fern.* Columbus OH: Ohio Department of Natural Resources, Division of Natural Areas and Preserves. Abstracts Online: http://www.dnr.state.oh.us/dnap/Abstracts/T/tricbosc.htm. (accessed April 24, 2007).

Davis, Jay. 2007. Personal communication (e-mail) between Jay Davis (Park Ranger, USACE) and Terry Reed (Senior Project Manager, Golder) regarding: recreation use at USACE East Lynn Lake project, dated February 27, 2007.

Davis, Jerry. 2007. Personal communication (phone conversation) between Jerry Davis (Frontier) and Elizabeth Duvall (Project Co-manager, Golder) regarding: utility rights of way. May 1, 2007.

Donovan, J.J. and J. Fletcher. 1999. Hydrogeological and Geochemical Response to Mine Flooding in the Pittsburgh Coal Basin, Southern Monongahela River Basin: Project WV-132. Report to the U.S. Environmental Protection Agency, 47 p. Online: http://wvmdtaskforce.com/proceedings/00/PDonovan.PDF (accessed October 21, 2007).

Dotson, Tom. 1992. *East Lynn Lake Wildlife Management Area; Forest Management Plan*. [Charleston, WV?]: West Virginia Department of Natural Resources. Supercedes the 1985 *Wildlife Management Area Management Plan* and the 1974 *Forest Management Plan*.

Drake, Richard B. 2001. *A History of Appalachia*. Lexington, KY : The University Press of Kentucky.

Dunrud, C. Richard. 1998. Engineering geology applied to the design and operation of underground coal mines. (Bulletin 2147). Denver CO: U. S. Geological Survey.

Eberle, Michael and Allan C. Razem. 1985. *Effects of surface coal mining and reclamation on ground water in small watersheds in the Allegheny Plateau, Ohio.* (Water Resources Investigations Report 85-4205). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/wri/wri854205.

Eble, Cortland F. 1994. Palynostratigraphy of selected Middle Pennsylvanian coal beds in the Appalachian basin, in *Elements of Pennsylvanian Stratigraphy, Central Appalachian Basin*, edited by C.L. Rice. (Special Paper 294). Boulder, CO: Geological Society of America, pp. 55-68.

Eggerud, Scott. 2007. Personal communication (phone conversation) between Scott Eggerud (West Virginia Department of Environmental Protection) and Annette Moltzan (Project Geologist, Golder) regarding: Applicants' non-compliance reports. Sept. 20, 2007.

Ehlke, Theodore A. 1982. *Hydrology of area 12, Eastern Coal Province, West Virginia.* (Open File Report 81-902). Washington, DC: U.S. Geological Survey.

Energy Information Administration (EIA). 2006. *Advance Summary; U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves 2005 Annual Report,* dated September 2006. [DOE/EIA-0216(2005)] Online: http://www.eia.doe.gov/pub/oil_gas/natural_gas/data_publications/advanced_summary/current/adsum.pdf (accessed May 3, 2007).

EIA. 2007a. *Domestic Distribution of U.S. Coal by Origin State, Consumer, Destination and Method of Transportation, 2004 (Thousand Short Tons),* Released January 2006. Washington, DC: U.S. Department of Energy. Online: http://www.eia.doe.gov/cneaf/coal/page/coaldistrib/o_wv_south.html (accessed April 25, 2007).

_____. 2007b. Appalachian Basin, West Virginia-Virginia (Panel 6 of 7) Oil and Gas Fields by 2001 BOE Reserve Class in *Maps: Exploration, Resources, Reserves, and Production; Detailed Oil and Gas Field Maps.* Washington, DC: U.S. Department of Energy. Online: http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/maps/maps.htm#pdf (accessed April 25, 2007).

_____. 2007c. Appalachian Basin, West Virginia -Virginia (Panel 6 of 7) Oil and Gas Fields by 2001 Gas Reserve Class in *Maps: Exploration, Resources, Reserves, and Production; Detailed Oil and Gas Field Maps.* Washington, DC: U.S. Department of Energy. Online: http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/maps/maps.htm#pdf (accessed April 25, 2007).

ESRI. 2006. *U.S. Major Roads: 2006 World, Europe, United States, Canada, and Mexico; represents interstates, U.S. and state highways, major streets, and other major thoroughfares within the United States*. [Data & Maps on CD]. Redlands CA: ESRI.

Etchart, Patrick. 2007. Personal Communication between Patrick Etchart (Public Affairs, U.S. DOI Minerals Management Service) and Elizabeth Duvall (Project Manager, Golder) November 30, 2007 regarding: federal coal royalty.

Evans, Mari-Lynn, Holly George-Warren, and Robert Santelli, with Tom Robertson. 2004. *The Appalachians; America's First and Last Frontier.* New York: Random House.

Federal Emergency Management Agency (FEMA). 1987. Flood Insurance Rate Maps (FIRM) for unincorporated Wayne County, West Virginia . Community Number 540200. Community Panel nos: 540200 0050B; 540200 0128; 540200 0129; 540200 0133; 540200 0134; 540200 0136; 540200 0137; 540200 0139; 540200 0141; 540200 0143; 540200 0144. FEMA online Map Service Center. Online: http://msc.fema.gov/ (accessed April 24, 2007).

Federal Energy Regulatory Commission (FERC). 2007. *Major Pipeline Projects on the Horizon (MMcf/d) March 2007*. On line: http://www.ferc.gov/industries/gas/gen-info/horizon-pipe.pdf (accessed April 30, 2007).

Federal Geographic Data Committee (FGDC) *See* Heber, Margarete 2007.

Federal Highway Administration (FHWA). 2007. Economic Development Highway Corridors Study, West Virginia, *in U.S. 64 Corridor Initiative*. http://www.fhwa.dot.gov/planning/econdev/westva.htm. (accessed December 1, 2007).

Federal Reserve Bank. 2004. Socioeconomic data. Richmond, VA: Federal Reserve Bank of Richmond. Online: http://www.richmondfed.org/community_affairs/socioeconomic_data/west_virginia.cfm (accessed March 3, 2007).

Ferone, Troy. 2007a. Written communication from Troy Ferone (Cultural Heritage Program Leader, BLM-ES) to Ana Vargo (Project Geologist, Golder) regarding: contact with several displaced Bands that claim historical affiliation. May 4, 2007.

_____. 2007 b. Personal Communication (voice-mail) to Troy Ferone (Archaeologist, BLM-MFO) from unknown (The Delaware Nation) regarding: removal of The Delaware Nation from the Consulting Parties list for the East Lynn Lake Project. Jan 2, 2007.

_____. 2007 c. Personal Communication (e-mail) from Troy Ferone (Archaeologist, BLM-MFO) to Ana Vargo (Project Geologist, Golder) regarding: response of the tribes as Consulting Parties for the East Lynn Lake project. Jan 2, 2007.

Ferrell, Gloria M. 1987. *West Virginia ground-water quality.* (Open File Report 87-0761). Denver CO: U.S. Geological Survey. http://pubs.er.usgs.gov/usgspubs/ofr/ofr87761.

Flora of North America Editorial Committee. 1993- . *Flora of North America; North of Mexico.* 20+ vols. New York: Oxford University Press.

Federal Reserve Bank of Richmond. 2004. Socioeconomic data. Online: http://www.richmondfed.org/community_affairs/socioeconomic_data/west_virginia.cfm. (accessed March 3, *2007*).

FRCC Interagency Working Group (FRCC). May 2005. *Interagency Fire Regime Condition Class Guidebook*, version 1.2. Online: http://www.frcc.gov/docs/1.2.2.2/Complete_Guidebook_V1.2.pdf (accessed April 2007).

Fulk, Florence and Bradley Autrey, John Hutchens, Jeroen Gerritsen, June Burton, Catherine Cresswell, and Ben Jessup. 2003. *Ecological Assessment of Streams in the coal Mining Region of West Virginia Using Data Collected by the U.S. EPA and Environmental Consulting Firms*. Cincinatti, OH: U.S. Environmental Protection Agency, National Exposure Research Laboratory.

Gao, Dengliang, Robert C. Shumaker and Thomas H. Wilson. 2000. Along-Axis Segmentation and Growth History of the Rome Trough in the Central Appalachian Basin. ***AAPG Bulletin*** vol. 84(1): pp. 75-99.

Gillispie, Ruben. 1993. *Cumulative Hydrologic Impact Assessment of the Kiah Creek Watershed, Wayne County, WV*, for the Pen Coal Kiah Creek Deep Mine #1 (S-5021/5022-91) and Pen Coal (S-5081-91, S-5015-89, U-5086-87, S-5042-90, O-5023-89, S5024-89, S-5063-89, S5005-92, O-5062-89, and S-5081-91), and Heartland Coal Co. (S-5055-92, S-5010-92, S-5014-90, and S-5051-91). Logan, WV: West Virginia Department of Environmental Protection.

Greb, Stephen F., Cortland F. Eble and J.C. Hower. 2005. Subtle structural influences on coal thickness and distribution: Examples from the Lower Broas-Stockton coal (Middle Pennsylvanian), Eastern Kentucky Coal Field, USA, *in Coal System Analysis*, edited by P.D. Warwick. (Special Paper 387). Boulder, CO: Geological Society of America, pp. 31-50.

Gocke, David. 2007. Personal communication between Mr. David Gocke (Southeast District Manager, Chesapeake Energy) and Ms. Elizabeth Duvall (Project Co-manager, Golder), regarding: hazardous material handling. September 27, 2007.

Goddard Institute for Space Studies (Goddard). 2007. Annual mean temperature change for three latitude bands. Datasets and images. GISS surface temperature analysis, analysis graphs and plots. New York: Goddard. Available on the Internet: http://data.giss.nasa.gov/gistemp/graphs/Fig.B.lrg.gif (accessed February 2009).

Golder Associates, Inc. (Golder.) 2004. *Record of Decision and Gray Mountain Coal Lease Land Use Analysis and Final Environmental Impact Statement,* prepared for the USFS Daniel Boone National Forest. Lakewood, CO: Golder.

Grafton, Emily. 2007. Dirty Dozen. information on invasive plant control. WVDNR Wildlife Resources. Online: http://www.wvdnr.gov/Wildlife/DirtyDozen.shtm (accessed June 21, 2007).

Grange, Stuart. 2007. Personal communication between Stuart Grange (Mining Engineer, BLM Jackson Field Office), and Elizabeth Duvall (Project Manager, Golder) regarding federal royalties on coal. December 5, 2007.

Hammond, George W. 2005. *West Virginia Economic Outlook 2006.* West Virginia University, Bureau of Business and Economic Research (BBER). Online: http://www.be.wvu.edu/bber/pdfs/BBER-2005-21.pdf (accessed November 2007).

Harlan, Sheilah C. 2007. Personal Communication from Sheilah C. Harlan (Chief, USACE Real Estate Division) to Walter Weinig (Senior Hydrologist, Golder), dated January 9, 2007, with corrections sent March 1, 2007. Unpublished water quality geochemical data supplied by the Huntington Office of the U.S. Army Corps of Engineers.

Harlow, George E. and Gary D. LeCain. 1985. *Hydraulic characteristics of, and ground-water flow in, coal-bearing rocks of southwestern Virginia*. (Water Supply Paper 2388). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/wsp/wsp2388.

Hartman, Howard L. (editor). 1992. *SME mining engineering handbook*, 2nd edition. Littleton, CO: Society for Mining, Metallurgy, and Exploration, Inc., 2 volumes.

Heber, Margarete. 2007. *Wetland Mapping Standard, FGDC (Working Draft),* prepared by the USEPA Office of Water for the FGDC Wetland Subcommittee and Wetland Mapping Standard Workgroup, dated March 26, 2007. Online: http://www.fws.gov/nwi/Final%20Draft%20Wetlands%20Mapping%20Standard%2003_26_07.pdf (accessed April 2007).

Hobba, W.A., Jr. 1993. *Effects of underground mining and mine collapse on the hydrology of selected basins in West Virginia* **.** (Water-Supply Paper 2384). Denver, CO: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/wsp/wsp2384.

Hook, Robert W. and Donald Baird. 1988. An Overview of the Upper Carboniferous Fossil Deposit at Linton, Ohio. ***Ohio Journal of Science*** v. 88(1): pp. 53-55.

Horton, Aaron G. 2006. *Initial consultation letters (7) sent to historically affiliated Tribal Governments: The Cherokee Nation, The Eastern Band of Cherokee Indians, The Delaware Nation, The Shawnee Tribe, The Absentee Shawnee Tribe of Oklahoma, The Eastern Shawnee Tribe of Oklahoma, and The United Keetoowah Band of Cherokee Indians*, from Aaron G. Horton (Former MFO Field Manager, BLM) and dated December 14. Milwaukee WI: U.S. BLM-MFO.

Huff, Carl P. 2007a. Personal communication (phone conversation) between Carl Huff (Appalachian Power) and Elizabeth Duvall (Project Co-manager, Golder) regarding: utility corridors. May 1, 2007.

_____.2007b. Personal communications between Carl Huff (Distribution, American Electric Power) and Elizabeth Duvall (Project Manager, Golder) regarding presence of transmission and distribution lines in the vicinity of the proposed lease tracts. May 10 and 11, 2007.

Huntington Area Development Council (HADCO). 2007. [Internet Web site]: http://www.hadco.org/.

The Huntington Regional Chamber of Commerce, serving Wayne and Cabell Counties. [Internet Web site]: http://www.huntingtonchamber.org/ (accessed March 2007).

Hurst, Dana R. 2007. Letter from Mr. Dana R. Hurst (Colonel, USACE) to Mr. John Romito (BLM-MFO) regarding: USACE assistance to the BLM in scoping the Land Use Analysis/Environmental Impact Statement for the coal lease applications WVES-50556 and WVES-50560, Wayne County, West Virginia, no date.

Institute for Systematic Botany (ISB). 2007. *Atlas of Florida Vascular Plants.* Online: http://www.plantatlas.usf.edu/main.asp?plantID=3631 (accessed March 13, 2007).

Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate Change 2007: The physical basis (summary for policymakers).* New York: Cambridge University Press. Available on the Internet: http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf (accessed February 2009).

John T. Boyd Company. 1973. *Coal Land Values, East Lynn Reservoir Area for Columbia Gas Transmission Corporation*. Referred to as the "Condemnation Report." Pittsburgh, PA: Columbia Gas.

Johnson-Hughes, Christy. 2007a. *Personal* communication (e-mail) between Christy Johnson-Hughes (Senior Biologist Project Planning, USFWS) and June Wendlandt (Natural Resource Specialist, BLM) regarding: threatened and endangered species list, February 9, 2007.

_____. 2007b. *Personal* communication (e-mail) between Christy Johnson-Hughes (Senior Biologist Project Planning, USFWS) and Christina Mills (East Lynn Lake Project Coordinator, Golder) regarding: Cerulean Warbler Conservation Action Plan, 2007. August 30, 2007.

Joint Work Group. 2003. "Guidance for evaluating the potential for breakthroughs from impoundments into mine workings and breakthrough prevention measures," prepared by a joint work group with representatives from MSHA, OSM, Kentucky DSMRE, Pennsylvania DEP, Virginia DMME, and the West Virginia DEP, revised May 15. Published as appendix D to: *Report to Congress: Responses to recommendation in the National Research Council's Report on Coal Waste Impoundments: Risks, Responses, and Alternatives*, submitted by MSHA and OSM, August 15. Online: http://www.osmre.gov/pdf/coalwastereport081503.pdf (accessed December 2007).

Jones, Brett. 2007. Personal communication (phone conversation) between Brett Jones (Wayne County Commission County Administrator) and Elizabeth Duvall (Project Co-manager, Golder) regarding: Wayne County utilities and 2010 Plan. May 1, 2007.

Jones, Fred. 2007. Personal communication (phone conversation) between Fred Jones (Chesapeake Appalachia) and Elizabeth Duvall (Project Co-manager, Golder) regarding: utilities and rights of way. May 1, 2007.

Jones, Jr., James B. 2003. Social Control, Social Displacement and Coal Mining in the Cumberland Plateau, 1880-1930. Posted on Southernhistory.net July 1, 2003. Online: http://www.southernhistory.net/ (USEPA 2003)

Kahn, Kathy. 1973. *Hillbilly Woman.* New York: Doubleday. (as cited in USEPA 2003).

King, Bruce. 2007. Personal communication (phone conversation) between Bruce King (Cabot Oil and Gas Corp.) and Elizabeth Duvall (Project Co-manager, Golder) regarding: wells and pipeline rights of way, May 1, 2007.

Kipp, James A. and James S. Dinger. 1991. Stress-relief fracture control of ground-water movement in the Appalachian plateaus, *in Proceedings of the Fourth Annual Eastern Regional Ground Water Conference: Focus Conference on Eastern Regional Ground-Water Issues, Burlington, VT, July 14-16, 1987.* Dublin, OH: National Water Well Association, pp. 423-438. Online: http://kgsweb.uky.edu/download/wrs/R30.PDF.

Kitchen, Tracy. 2009. Personal communication (phone conversation) between Tracy Kitchen (Geologist, West Virginia Department of Environmental Protection) and Walter Weinig (Senior Consultant, Golder) regarding: potential for high-extraction mining in the East Fork of Twelvepole Creek watershed. January 15, 2009.

Kohli, Kewal and Fred Block. 2007. *Guidance Manual: Outcrop barrier design for above drainage coal mines.* [Washington, DC]:U.S. Office of Surface Mining Reclamation and Enforcement.

Kosanke, Robert M. 1988. *Palynological Studies of Middle Pennsylvanian Coal Beds of the Proposed Pennsylvanian System Stratotype in West Virginia* . (Professional Paper 1455). Washington DC: U.S. Geological Survey, 73 p. Online: http://pubs.er.usgs.gov/usgspubs/pp/pp1455.

Kozar, Mark D. and David P. Brown. 1995. *Location and site characteristics of the ambient ground-water-quality-monitoring network in West Virginia.* (Open File Report 95-130). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/ofr/ofr95130.

Kozar, Mark D. and Melvin V. Mathes. 2001. *Aquifer-characteristics data for West Virginia.* (Water Resources Investigations Report 01-4036). Washington, DC: U.S. Geological Survey. Online: http://pubs.usgs.gov/wri/wri01-4036/.

KYOVA Interstate Planning Commission (KYOVA). 2002. *Long Range Transportation Plan*. Online: www.wvs.state.wv.us.kyova. (accessed January–May, 2007).

KYOVA. 2007. *Definition of recognized geographical area of activity for MSA (metropolitan statistical area).* Online: http://www.wvs.state.wv.us/kyova/ (accessed May 8, 2007).

Lamarre, Lora. 2001. *Preserving our mountain heritage; Statewide historic preservation plans.* Charleston WV: West Virginia Division of Culture and History. Online: http://www.wvculture.org/shpo/fiveyearplan/index.html (accessed February 20, 2007).

Langbein, W. B. and Kathleen T. Iseri. 1960. General introduction and hydrologic definitions, chapters 1-3 of *Manual of Hydrology: Part 1. General Surface-Water Techniques, Methods and practices of the Geological Survey* (USGS Water-Supply Paper 1541-A). Online (Science in Your Watershed): http://water.usgs.gov/wsc/glossary.html (accessed December 2007).

Lantz, Herman R. 1958. *People of Coal Town*. New York: Columbia University Press.

_____. 1964. "Resignation, Industrialization, and the Problem of Social Change: A Case History of a Coal-Mining Community," *in Blue Collar World: Studies of the American Worker*, edited by Arthur B. Shostak and William Gomberg. Englewood Cliffs, NJ: Prentice-Hall, Inc., 258-270.

Leavitt, B.R. 1999. Mine flooding and barrier pillar hydrology in the Pittsburgh basin. ***Proceedings of the 16th Annual International Pittsburgh Coal Conference, Pittsburgh, PA***. Pittsburgh, PA: University of Pittsburgh, Center for Energy Research, 11p.

Lewis, Ronald L. 2004. Appalachian myths and the legacy of coal *in The Appalachians; America's First and Last Frontier,* edited by Mari-Lynn Evans and others. New York: Random House, pp. 75-83.

Lewis, Ronald L. and Dwight B. Billings. 1997. *Appalachian Culture and Economic Development: A Retrospective View on the Theory and Literature.* ***Journal of Appalachian Studies*** 3: 3-42.

Limerick, Samuel. 2004. *United States Coalbed Methane Maps* (Panel 2 of 2 in Master of Science in GIS Project). Washington DC: U.S. Department of Energy, Energy Information Administration. Online: http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/maps/maps.htm.

Lockard, Duane. 1998. Coal: A Memoir and Critique. Charlottesville, VA: University Press of Virginia.

Loeb, Penny. 2003. Coal fields of southern West Virginia [Internet Web Site]: http://www.wvcoalfield.com/ (accessed February 12, 2008).

Luo, Y., S.S. Peng and Y.Q. Zhang. 2001. Simulation of water seepage through and stability of coal mine barrier pillars. Transactions of the Society for Mining, Metallurgy and Exploration, Inc. (Preprint number 01-131). Denver CO: SME.

Maggard, Randy. 2004. The occurrence and impacts of selenium in aquatic systems downstream of a mountaintop mining operation in central Appalachia. *2004 National Meeting of the American Society of Mining and Reclamation and the 25th West Virginia Surface Mine Drainage Task Forces, April 18-24, 2004.* Lexington KY: ASMR.

_____. 2006. Personal communication from Randy Maggard (Manager of Environmental Compliance, Argus) to Elizabeth Duvall (Project Co-manager, Golder) regarding: resource information related to proposed lease tracts. November 7, 2006.

_____. 2007a. Personal communication (phone conversation) between Randy Maggard (Manager of Environmental Compliance, Argus) and Elizabeth Duvall (Project Co-manager, Golder) regarding: existing coal mining and oil and gas drilling activities. May 5, 2007.

_____. 2007b. Personal communication (phone conversation) between Randy Maggard (Manager of Environmental Compliance, Argus) and Annette Moltzan (Project Geologist, Golder) regarding: geologic hazards. August 29, 2007.

_____. 2007c. Personal communication (phone and e-mail) between Randy Maggard (Manager of Environmental Compliance, Argus) and Annette Moltzan (Project Geologist, Golder) regarding: water well locations, subsidence crack, and Argus mining operations. May 8 and 9, 2007.

_____. 2007d. Personal communication (phone conversation) between Randy Maggard (Manager of Environmental Compliance, Argus) and Elizabeth Duvall (Project Co-manager, Golder) regarding: USACE comments; impairment of East Lynn Lake; lack of mining in Rich Creek; water sampling in the No. 3, No. 6, and No. 8 Mines; water chemistry in East Fork of Twelvepole Creek; lack of notices of violations for slurry impoundments. December 18, 2007.

_____. 2007e. Personal communication (phone conversation) between Randy Maggard (Manager of Environmental Compliance, Argus) and Elizabeth Duvall (Project Co-manager, Golder) regarding: existing impacts to groundwater from surface mining; Notices of Violation on Kiah Creek; surface mining and acid mine drainage; duration of existing mining; abandoned mines; absence of commercial mine lands on Argus permitted areas; slide in Martin County, KY. November 2, 2007.

_____. 2007f. Personal communication (telephone) between Mr. Randy Maggard (Manager of Environmental Compliance, Argus) and Rebecka Snell (Project Coordinator, Golder), re: probable population of the unincorporated towns in Wayne County. November 15, 2007.

_____. 2007g. Personal communication (e-mail) between Randy Maggard (Manager of Environmental Compliance , Argus) and Elizabeth Duvall (Project Manager, Golder), re:employees and their communities of residence. December 10, 2007.

_____. 2007h. Personal communication (e-mail) between Randy Maggard (Manager of Environmental Compliance , Argus) and Elizabeth Duvall (Project Manager, Golder), re: salaries, wages, vendors and contractors. July 16, 2007.

_____. 2007i. Personal communication (e-mail) between Randy Maggard (Manager of Environmental Compliance, Argus) and Elizabeth Duvall (Project Co-manager, Golder) regarding: existing air emissions. September 25, 2007.

_____. 2007j. Personal communication (phone conversation) between Randy Maggard (Manager of Environmental Compliance, Argus) and Elizabeth Duvall (Project Co-manager, Golder) regarding: existing hazardous material use and storage; evaporation values; bat surveys; benthic macroinvertebrate, habitat; and water chemistry data. October 24, 2007.

_____. 2007k. Personal communication (telephone) between Randy Maggard (Manager of Environmental Compliance, Argus) and Elizabeth Duvall (Project Co-manager, Golder) regarding: gas well permitting; slurry impoundments; coal refuse piles; coal preparation plant. October 3, 2007.

_____. 2008. Personal communication (telephone) between Randy Maggard (Manager of Environmental Compliance , Argus) and Elizabeth Duvall (Project Manager, Golder), regarding: impacts to water quantity and quality due to existing surface and underground mining. January 15, 2008.

Mairs, John.2007. Personal communication (telephone) between Mr. John Mairs (legal counsel for the West Virginia Coal Association) and Ms. Elizabeth Duvall (Project Manager, Golder) regarding: royalties and taxes on federal coal in West Virginia. December 13, 2007.

Maptech. 1998. Terrain navigator [software]. GIS-ready USGS topos. Online: http://maptech.mytopo.com/onlinemaps/index.cfm (accessed February 2009).

Marcum, Carl. 2007. Personal communication between Carl Marcum (Extension Agent, West Virginia University Agricultural Extension Service), and Elizabeth Duvall (Project Manager, Golder) regarding: the Agricultural Extension Agency's role in the communities of Wayne, East Lynn, and Dunlow. December 4, 2007.

Marshall Miller and Associates (MM&A). nd. Rockspring Development, Inc. Camp Creek Mine, Supplemental Information for Permit No. U-25-84, Original and Modification No. 9 Areas, volumes 1A and 1B. (maps, attachments, biographies and well pumping test summaries on CD).

MM&A. 1991. Geologic evaluation of the Coalburg Seam, Devilstrace, Kiah Creek, Bluewater, and Left Fork Reserve Areas Wayne County, West Virginia . Richmond,VA: MM&A.

_____. 1992. Geologic Evaluation of the Coalburg Seam Area 6, Wayne County. Richmond VA: MM&A, 3 vols.

_____. 1995. Ben Haley Attachment J to Rockspring Permit Rockspring U-5028-95 (Modification No. 1 and Original Areas). Richmond, VA: MM&A.

_____. 2001. Ben Haley South Area, Attachment J to Rockspring Permit U5028-95, Modification 2. Richmond,VA: MM&A.

_____. 2002. Lincoln, Attachment J to Rockspring Permit U5028-95, Modification 1. Richmond, VA: MM&A.

_____. 2003. Rockspring Permit Modification Nos. 1, 2. and 9, Supplemental Narrative J-5.1 Richmond ,VA: MM&A.

_____. 2005. Investigation of streamflow conditions in Laurel Creek and reference streams, Wayne and Lincoln Counties, West Virginia, prepared for Rockspring Development, April 2005. [the "Squeeze Report"]. Bluefield, VA: MM&A. 2 volumes.

Marshall University. 2005a. Cabwaylingo State Forest. [Internet Web site]: http://webpages.marshall.edu/~rfry/CABWAYLINGO.html. (accessed on February 21, 2007).

_____. 2005b. East Lynn Lake Wildlife Management Area. [Internet Web site]: http://webpages.marshall.edu/~rfry/ellake.htm. (accessed on February 21, 2007).

Martino, Ronald L. 1989. Trace fossils from Marginal Marine Facies of the Kanawha Formation (Middle Pennsylvanian), West Virginia. Journal of Paleontology v. 63(4): pp. 389-403.

_____. 1994. Facies analysis of Middle Pennsylvanian marine unites, southern West Virginia, in Elements of Pennsylvanian Stratigraphy, Central Appalachian Basin, edited by C.L. Rice. (Special Paper 294). Boulder CO: Geological Society of America, pp. 41- 53.

Martino, Ronald L., Mark A. McCullough, and Terry L. Hamrick. 1996. Stratigraphic and depositional framework of the Glenshaw Formation (Late Pennsylvanian) in Wayne County, West Virginia. Southeastern Geology v. 36(2): pp. 64-83.

Mathes, M. V. and M. C. Waldron. 1993. Distribution of fluoride in ground water of West Virginia . (Open File Report 92-140). Washington, DC: U.S. Geological Survey.

Mathur, S.K.and M. R. Mikkilineni. 1982. Preliminary predictive model of subsidence process over room and pillar workings. Phase I: definition factors. Contract research prepared by MRM Engineers, P.C. (Open File Report 68-83; contract J0100073). Available NTIS (PB3-191759). Washington DC: U.S. Bureau of Mines.

May, Melissa and Becky Hall. 2007. Personal communication (e-mail) between Melissa May, (Controller, Argus), Becky Hall, (Payroll Administrator, Argus) and Bindi Patel (Resource Specialist, Golder) regarding: Argus Energy WV, LLC employment and financial information, dated March 22, 2007 and April 11, 2007.

McColloch, Jane S. 1986. Springs of West Virginia, 50th Anniversary Revised Edition (volume V-6A). Charleston, WV: West Virginia Geological and Economic Survey.

McComas, Gregory A. and Royal H. Mapes. 1988. Fauna associated with the Pennsylvanian Floral Zones of the 7-11 Mine, Columbiana County, Northeastern Ohio. Ohio Journal of Science vol. 88(1): pp. 53-55.

McCoy, Kurt J., Joseph J. Donovan, and Bruce R. Leavitt. 2006. Horizontal hydraulic conductivity estimates for intact coal barriers between closed underground mines. Environmental & Engineering Geoscience, vol. 12(3): pp. 273-282.

McEvoy, Frederick. 1996. Comprehensive Statewide Historic Plan. Charleston, WV: West Virginia State Historic Preservation Office. Online: http://www.wvculture.org/shpo/fiveyearplan/index.html.

McKinley Natalie J. 2006. Huntington District annual flood damages prevented, report for FY06. Huntington, WV: USACE Huntington District.

McMichael, Edward V. and Oscar L. Mairs. 1965. An archeological survey of East Lynn Reservoir, Wayne County, West Virginia, report submitted to the National Park Service.

_____. 1969. Excavation of the Murad Mound, Kanawha County, West Virginia, and an analysis of Kanawha valley mounds. (Report of archeological investigations no. 1). Morgantown, WV: West Virginia Geological and Economic Survey.

Messinger, Terence, and C.A. Hughes. 2000. Environmental setting and its relations to water quality in the Kanawha River Basin. (Water-Resources Investigations Report 00-4020). Washington, DC: U.S. Geological Survey. Online: http://pubs.usgs.gov/wri/wri004020/.

Miller, J.T. and D.R. Thompson. 1974. Seepage and mine barrier width, in Papers presented before the fifth Symposium on Coal Mine Drainage Research: October 22-23-24, 1974, Louisville, KY. Washington, DC: National Coal Association, pp. 103-127.

Miller, Kathy, 2006. Urban/Rural Areas and CBSAs. (RUPRI Internal Working Paper), revised August 15. Columbia, MO: Rural Policy Research Institute. Online: http://www.rupri.org/Forms/WP2.pdf; graphic at http://circ.rupri.org/maparchive/NatlRuralPolicy/CBSAstatus.jpg>. (accessed November 2007).

Minerals Management Service (MMS). 2004. MMS Facts and Figures 2003. U.S. Department of the Interior. Online: http://www.mms.gov/ooc/newweb/publications/2003%20FACT.pdf (accessed November 2007).

Montgomery, Bill. 1972. "The Uptown Story," in Appalachia in the Sixties: Decade of Reawakening, edited by David S. Walls and John B. Stephenson. Lexington, KY: University Press of Kentucky, 144-45.

Mooney, Stephen D. 1998. Mountain Voices; The socio-cultural ramifications of declines in coal mining employment and production in the Southwestern Virginia coalfields. (Report No. 98-02) Blacksburg, VA: Virginia Tech, Virginia Center for Coal and Energy Research.

National Academy of Sciences. 2006. Understanding and responding to climate change: highlights of National Academies Reports. Washington, DC: National Academy of Sciences. Division on Earth and Life Studies. Available on the Internet: http://dels.nas.edu/basc/Climate-HIGH.pdf (accessed February 2009).

National Agricultural Statistical Service (NASS). 2007. [Internet Web site]: http://www.nass.usda.gov/index.asp (accessed November 2007).

National Center for Education Statistics. 2007. [Internet Web site]: www.nces.ed.gov (accessed January 17, 2007).

National Climatic Data Center (NCDC). 2002. Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971-2000, West Virginia. (Climatography of the United States Number 81). Silver Spring, MD: U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration.

NCDC. 2006. Monthly precipitation data, West Virginia station #46, 1997-2006. (Data downloaded Dec. 2006). Silver Spring, MD: U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration.

National Coal Board (NCB). 1975. Subsidence Engineers' Handbook. Mining Department of the National Coal Board, U.K.

National Conference of State Legislatures (NCSL). 2004[?]. State Historic Preservation Legislation Database 1999. Online: http://www.ncsl.org/programs/arts/statehist_intro.htm (accessed September 2007).

Natural Resources and Conservation Service (NRCS). 2001. Soil Survey of Wayne County, West Virginia, prepared in cooperation with the West Virginia Agricultural and Forestry Experiment Station.

NRCS. 2006. Soil Survey Geographic (SSURGO) Database. Online: http://soildatamart.nrcs.usda.gov (accessed May 10, 2007).

_____.2007. The PLANTS Database. Baton Rouge, LA: U.S. Department of Agriculture, National Plant Data Center. Online: http://plants.usda.gov (accessed April 24, 2007).

Neuzil, S.G. 2001. Summary Report on the Coal Resources, Coal Production, and Coal Quality of the Allegheny Group No. 5 Block, and the Pottsville Group Stockton and Coalburg, Winifrede/Hazard, Williamson/Amburgy, Campbell Creek/Upper Elkhorn No. 3, and Upper Elkhorn Nos. 1, in 2000 Resource Assessment of Selected Coal Beds and Zones in the Northern and Central Appalachian Basin Coal Regions, by the Northern and Central Appalachian Basin Coal Regions Assessment Team. (Professional Paper 1625-C), Washington, DC: U.S. Geological Survey. p. I1-I128. Online: http://pubs.usgs.gov/prof/p1625c/ (accessed May 2, 2007).

Nolder, Jeff. 2007. Personal communication (telephone) between Jeff Nolder (Geologist, BLM-MFO) and Elizabeth Duvall (Project Manager, Golder) regarding: federal coal royalty. November 30 and December 5, 2007.

Office of Surface Mining (OSM). 1999. 1999 Annual Report, Office of Surface Mining. January 2000. Online: http://www.osmre.gov/annualreport.htm (accessed December 10, 2007).

OSM. 2001. Criteria for evaluating the potential for impoundment leaks into underground mines, prepared by the ARCC Impoundment Team in cooperation with regulatory officials from Virginia, West Virginia and Kentucky. Lexington, KY: U.S. Office of Surface Mining, Appalachian Regional Coordinating Center (ARCC). Available from the OSM Web site: http://www.osmre.gov/martincounty030402.htm (accessed December 2007).

_____.2004. Annual evaluation summary report for the regulatory and abandoned mine land reclamation programs administered by the state of West Virginia, for evaluation year 2004: July 1, 2003 to June 30, 2004. Charleston West Virginia: OSM Charleston Field Office. Online: http://www.osmre.gov/oversight/westvirginia04.pdf.

_____.2007, See Kohli and Block 2007.

Osborne, Kevin L. 2007. Personal communication (e-mail) between Kevin L. Osborne (USACE) and Beth Duvall (Project Manager, Golder) re: water wells on USACE property. November 9, 2007.

P&A Engineers and Consultants, Inc. (P&A). various dates. Miscellaneous Reports related to Argus Permit U-5028-93, including complaint investigations and enforcement.

P&A. 1999. Pen Coal Application for Competitive Lease: East Lynn Federal Reserve Area. Dunlow, WV: Pen Coal Company. 6 vol.

_____. 2000a. Devilstrace No. 3 Deep Mine (Argus Permit U-5028-93, Amendment No. 1).

_____. 2000b. Inspection Reports: Underground Mine No. 8 (Argus Permit No. U-5023-92, various dates 2000-2005).

_____. 2006. Devilstrace no. 2 Punch-out (Mine No. 8); Argus Permit No. U-5023-92, Revision No. 5.

Paybins, Katherine S. 2003. Flow origin, drainage area, and hydrologic characteristics for headwater streams in the Mountaintop Coal-Mining Region of southern West Virginia, 2000-01. (Water Resources Investigations Report 02-4300). Washington, DC: U.S. Geological Survey. Online: http://pubs.usgs.gov/wri/wri02-4300/.

Pen Coal Corporation. 1992-2002. Permit U-5028-93, Violations.

_____. 1994. Surface Mining Application (SMA 5028-93; NPDES WVG-04991), 2 volumes.

Peng, Syd. 1992. Surface and Subsidence Engineering. Littleton, CO: Society for Mining, Metallurgy, and Exploration.

PennWell Publishing Company. 1990. Natural gas pipelines of the United States and Canada, 3rd ed. Map: color ; 99 x 142 cm. Tulsa, OK: PennWell.

Perry, Keith. 2007. Personal communication between Keith Perry (4H Agent, West Virginia University Agricultural Extension Service), and Elizabeth Duvall (Project Manager, Golder) regarding: the Agricultural Extension Agency's role in the communities of Wayne, East Lynn, and Dunlow. December 4, 2007.

Persing, Carl. 2007. Personal communication between Carl Persing (Manager, Transmission Line Engineering, American Electric Power) and Elizabeth Duvall (Project Manager, Golder) regarding: presence of transmission and distribution lines in the vicinity of the proposed lease tracts. May 4, 2007.

Peterson, Chuck H. 2008. Personal communication (e-mail) from Chuck Peterson (Manager, Research and Strategic Planning Division, West Virginia Development Office) to Rebecka Snell (Project Coordinator, Golder) re: economic impact of the coal mining industry in West Virginia. January 17, 2008.

Pollard, Kelvin M. 2003. Appalachia at the Millennium: An Overview of Results from Census 2000 Washington, DC: Population Reference Bureau. Online: http://www.arc.gov/images/reports/census2000/overview/appalachia_census2000.pdf (accessed November 2007).

Pond, Gregory J., Margaret E. Passmore, Frank A. Borsuk, Lou Reynolds, and Carole J. Rose. 2008. Downstream effects of mountaintop coal mining: comparing biological conditions using family and genus-level macroinvertebrate bioassessment tools. Journal of the North American Benthological Society vol. 27(3):p. 717-737.

Preston, John. 2007. Personal communication (e-mail) between John Preston (USACE Ecologist, Planning Division) and Terry Reed (Senior Project Manager, Golder), regarding: coal estate, dated May 2, 2007.

Price, W. A. 1997. Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia. Smithers, BC: British Columbia Ministry of Energy and Mines, Energy and Minerals Division. 158 p.

Puente, Celso and John T. Atkins. 1989. Simulation of rainfall-runoff response in mined and unmined watersheds in coal areas of West Virginia. (Water Supply Paper 2298). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/wsp/wsp2298.

Radbruch-Hall, D.H., R.B. Colton, W.E. Davies, Ivo Lucchitta, B.A. Skipp, and D.J. Varnes. 1982. Landslide overview map of the conterminous United States, scale 1:7500000. (Professional Paper 1183). Washington, DC: U.S. Geological Survey.

Raitz, Karl B. and Richard Ulack. 1984. Appalachia; a Regional Geography, Land, People and Development. Boulder, CO: Westview Press.

Raup, D.M. 1987. Paleontology Collecting: National Academy of Sciences Committee on Guidelines for Paleontological Collecting. Washington, DC: National Academy Press, 243 p.

Razem, Allan C. and Alan C. Sedam. 1985. Ground-water quality and geochemistry of aquifers associated with coal in the Allegheny and Monongahela formations, southeastern Ohio. (Water Resources Investigations Report 85-4034). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/wri/wri854034.

Reed, Daniel W. 2002. Wildflowers of the Southeastern United States. Online: www.2bnTheWild.com. (accessed February 18, 2007).

REI Consultants (REIC). 2000-2006. Benthic reports on Milam, Kiah, Twelvepole, Trough Fork, Big Laurel, and East Lynn Lake surface water quality, habitat, and benthic macroinvertebrates [yearly reports].

Rockspring Development, Inc. (Rockspring). 2004. BLM Coal Lease Application; East Lynn Lake Reservoir, Wayne County, West Virginia . (Application No. WVES-50560). East Lynn, WV: Rockspring Camp Creek Complex.

Rockspring. 2006. Drawing file supplied by Rockspring: CORPLANDB.DWG

_____. 2007. Proprietary GIS and CAD data provided to Golder Associates Inc. to prepare figures and maps for the LUA/EIS. Rockspring Development Inc. East Lynn, WV: Rockspring.

Rollyson, G. Russell. 2007a. Personal Communication (telephone) between Russ Rollyson (Deputy State Auditor, West Virginia State Auditor's Office) and Elizabeth Duvall (Project Manager, Golder), regarding: federal coal royalty and state severance tax. November 30, 2007.

_____. 2007b. Personal Communication (telephone) between Russ Rollyson (Deputy Auditor, West Virginia State Auditor's Office) and Elizabeth Duvall (Project Manager, Golder), regarding: federal coal royalty and state severance tax. December 13, 2007.

_____. 2008. Personal Communication (letter) from Russ Rollyson (Deputy StateAuditor, West Virginia State Auditor's Office) to Mr. Joseph Stanley (citizen, Pritchard, WV), regarding: state statutes governing distribution of royalties from federal coal, dated September 19,2008.

Rowe, Jacquelyn M., and Charles B Yuill. 1997. Landscape-Level Habitat Modeling for Amphibians and Reptiles in West Virginia. Morgantown, WV: West Virginia University, Natural Resource Analysis Center, College of Agriculture and Forestry. Online: http://www.GAP.uidaho.edu/Meetings/Posters/97Posters/wv/wvposter.htm (accessed March 2007).

Rural Policy Research Institute (RUPRI). 2006. Demographic and Economic Profile; West Virginia. Updated June 2006. Online: www.rupri.org/Forms/WestVirginia.pdf (Accessed November 14, 2007).

Russell, Alice B. 2007. Poisonous Plants of North Carolina: Creeping Cucumber Melothria pendula. Raleigh, NC: North Carolina State University Department of Horticultural Science (Dr. James W. Hardin, Botany; Dr. Larry Grand, Plant Pathology; and Dr. Angela Fraser, Family and Consumer Sciences). Online: http://www.ces.ncsu.edu/depts/hort/consumer/poison/Melotpe.htm (accessed March 13, 2007).

Ryder, Robert T., David C. Harris, Paul Gerome, Tim J. Hainsworth, Robert C. Burruss, Paul G. Lillis, Daniel M. Jarvie, and Mark J. Pawlewicz. 2005. Evidence for Cambrian Petroleum Source Rocks in the Rome Trough of West Virginia and Kentucky, Appalachian Basin. (USGS Open-File Report 2005-1443). Online: http://pubs.usgs.gov/of/2005/1443/ (accessed May 3, 2007).

SAMB, See West Virginia State Addressing and Mapping Board.

Sargent, Barbara. 2006. Letter to Aaron G. Horton (Field Manager, BLM) from Barbara Sargent (Environmental Resource Specialist, WVDNR), regarding: record of species on the Rare, Threatened and Endangered Species list, dated Dec. 27, 2006.

Saunders, Philip. 2008. Personal communication (telephone) between Philip Saunders (Vice President Engineering, Rockspring) and Elizabeth Duvall (Project Manager, Golder), regarding: life of existing mining operation; other reserves in area and reasonably foreseeable future mining as a result of proposed mining; stream buffers; collection and discharge of groundwater from underground mines. January 22, 2008.

Schuerger, Mark. 2007a. Personal communication from Mark Schuerger (VP Engineering, Rockspring) to Annette Moltzan (Golder Associates, Inc.) regarding: Rockspring mining operations. May 8, 2007.

_____. 2007b. Personal communication from Mark Schuerger (VP Engineering, Rockspring) to Terry Reed (Project Manager, Golder), regarding: Rockspring mining operations buffer to dam.

Scragg, John D. 2007. Personal communication (e-mail) between John D. Scragg (East Lynn Park Ranger, USACE) and Beth Duvall (Project Manager, Golder re: H2O Wells, Water Plants and Punch Mines, dated November 5, 2007.

Sgambat, Jeffrey P., Elaine A. LaBella, and Sheila Roebuck. 1980. Effects of underground coal mining on ground water in the eastern United States. (EPA-600/7-80-120). Cincinnati OH: U.S. Environmental Protection Agency, Office of Research and Development, Industrial Environmental Research Laboratory, 183 p.

Shultz, R. A. 1988. Ground-water hydrology of Marshall County, West Virginia, with emphasis on the effects of longwall coal mining. (Water Resources Investigation 88-4006). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/wri/wri884006.

Singer, Alan J. 1996. "Something of a Man: John L. Lewis, the UMWA, and the CIO, 1919-1943," in The United Mine Workers of America: A Model of Industrial Solidarity? edited by John H. M. Laslett. University Park, PA: Pennsylvania State University Press, p.104-150.

Smardon, R.C., J.F. Palmer, A. Knopf, K. Grinde, J.E. Henderson, and L.D. Peyman-Dove. 1988. Visual Resources Assessment Procedure for U.S. Army Corps of Engineers. (Instruction Report EL-88-1). Washington, DC: U.S. Army Corps of Engineers.

Smith, G. Michael. 2007a. Personal communication from Mike Smith (East Lynn Lake Resource Manager, USACE) to Ana Vargo (Project Geologist, Golder) regarding: resource information at East Lynn Lake. April 9 and 12, 2007.

_____. 2007b. Written communication from Mike Smith (East Lynn Lake Resource Manager, USACE) to Ana Vargo (Project Geologist, Golder) regarding: FRCC classification at East Lynn Lake, April 20, 2007.

_____. 2007c. Personal communication (phone) between Mike Smith (East Lynn Lake Resource Manager, USACE) and Elizabeth Duvall (Project Co-manager, Golder) regarding: utilities located on the USACE East Lynn Lake Project. April 29, 2007.

_____. 2007d. Personal communication (phone) between Mr. Mike Smith, (East Lynn Lake Resource Manager, USACE) and Ms. Bindi Patel (Resource Specialist, Golder) regarding: visual resources at USACE East Lynn Lake Project. May 8, 2007.

_____. 2007e. Personal communication between Mike Smith (East Lynn Lake Resource Manager, USACE) and Elizabeth Duvall (Project Co-manager, Golder) regarding: resource information at East Lynn Lake. April 9 and 12, 2007.

_____. 2007f. Personal communication between Mike Smith (East Lynn Lake Resource Manager, USACE) and Elizabeth Duvall (Project Co-manager, Golder) regarding: oil and gas pipelines. May 9, 2007.

_____. 2007g. Personal communication between Mike Smith (East Lynn Lake Resource Manager, USACE) and Bindi Patel (Golder, Project Environmental Planner) regarding: employment statistics for the East Lynn Lake project. April 23, 2007.

_____. 2007h. Personal communication between Mike Smith (East Lynn Lake Resource Manager, USACE) and Elizabeth Duvall and Terry Reed (Project Co-managers, Golder) regarding: roads, springs, recreation use, and other topics on the East Lynn Lake project. March 26, 2007.

_____. 2007i. Personal communication (e-mail) between Mike Smith (East Lynn Lake Resource Manager, USACE) and Terry Reed (Golder, Project Manager) regarding: visitation counts and ORV use on the East Lynn Lake project. June 21, 2007.

_____. 2007j. Personal communication (phone) between Mike Smith (East Lynn Lake Project Resource Manager, USACE) and Elizabeth Duvall (Project Co-manager, Golder) regarding: water resources, vegetation, exotic and invasive species, wetland and riparian resources, hazardous materials, recreation, oil and gas development. June 21, 2007.

_____. 2007k. Personal communication (phone) between Mike Smith (East Lynn Lake Project Resource Manager, USACE) and Elizabeth Duvall (Project Co-manager, Golder) regarding: sewage treatment plants at the East Lynn Lake Project. May 11, 2007.

_____. 2007l. Personal communication (phone) between Mike Smith (East Lynn Lake Project Resource Manager, USACE) and Elizabeth Duvall (Project Co-manager, Golder), regarding: hazardous materials on the USACE East Lynn Lake Project. September 18, 2007.

Social Security Administration. 2007. Supplemental Security Income. Online: http://www.socialsecurity.gov/ssi/ (accessed December 1, 2007).

Southworth, C. Scott, Karen J. Gray and John Sutter. 1992. Middle Eocene intrusive igneous rocks of the Central Appalachian Valley and Ridge province-setting, chemistry, and implications for crustal structure. Chapter J in Evolution of Sedimentary Basins–Appalachian Basin. (Bulletin 1839-J). U.S. Geological Survey, 24 p. Online: http://pubs.er.usgs.gov/usgspubs/b/b1839J (accessed February 2008).

St. Mary's Medical Center. 2006. [Internet Web site]: http://www.st-marys.org/about.asp. (accessed on February 19, 2006).

Stamper, Dale. 2007. Personal communication (telephone) between Mr. Dale Stamper (Postmaster, Dunlow Post Office) and Rebecka Snell (Project Coordinator, Golder), regarding: probable population of the unincorporated towns in Wayne County. November 15, 2007.

Stout, Ben M. III. 2003. Impact of longwall mining on headwater streams in northern West Virginia; final report, June 30, 2003. Morgantown, WV: West Virginia Water Research Institute.

_____. 2004. Do headwater streams recover from longwall mining impacts in northern West Virginia ; final report, August 30, 2004. Morgantown, WV: West Virginia Water Research Institute.

Strager, Jacquelyn M. 2000. West Virginia Wetland/Riparian Habitat Model, ARC/INFO GRID: West Virginia Gap Analysis Project. Morgantown, WV: West Virginia University, Natural Resource Analysis Center and West Virginia, Cooperative Fish and Wildlife Research Unit. Online: http://www.nrac.wvu.edu/GAP/herp99/wv_herp.html (accessed March 2007).

Strager, Jacquelyn M. and Charles B. Yuill. 2002. The West Virginia Gap Analysis Project Final Report. Morgantown, WV: Natural Resource Analysis Center, West Virginia University. Online: http://www.nrac.wvu.edu/GAP/pub.htm#Data (accessed May 1, 2007).

Strager, Jacquelyn M., Charles B. Yuill, Petra Bohall Wood, Ree Brannon. 2000. West Virginia Gap Analysis Land Cover (wvlandcovgclp): West Virginia Gap Analysis Project. Morgantown, WV: West Virginia University, Natural Resource Analysis Center and West Virginia Cooperative Fish and Wildlife Research Unit. Online: http://www.nrac.wvu.edu/GAP/pub.htm (accessed March 2007).

Strausbaugh, P.D. and E.L. Core. 1970. Flora of West Virginia. Morgantown, WV: Seneca Books, Inc.

Taylor, F. M. and M.T. Rosier. 1986. Ground-water data for West Virginia, 1974-84. (Open-File Report 86-320). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/ofr/ofr86320.

Thompson, Eric C., Mark C. Berger, Steven N. Allen, and Jonathan M. Roenker 2001. A Study on the Current Economic Impacts of the Appalachian Coal Industry and its Future in the Region (Appalachian Regional Commission under contract # CO-12884H) Lexington, KY: University of Kentucky Gatton College of Business and Economics, Center for Business and Economic Research. Online: http://www.arc.gov/index.do?nodeId=57 (accessed January 2008).

Thompson, Robert Michael. 2007. East Lynn Booming. Genoa, WV: RMT.

Thomspon, T. William. 2007. Personal communication between William Thompson (Senior Geotechnical Engineer, Golder Associates Inc.) and Paul Williams (Water Resources Leader, Golder Associates Inc.). regarding: the permeability of the proposed 150-foot outcrop barrier. October 18, 2007.

Town of Wayne Police. 2007. Personal communication with Bindi Patel (March 2007).

Trapp, Henry, Jr. and Marilee A. Horn. 1997. Ground Water Atlas of the United States; Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, West Virginia . (Hydrologic Atlas HA 730-L). Washington, DC: U.S. Geological Survey. Online: http://capp.water.usgs.gov/gwa/ch_l/index.html.

U.S. Army Corps of Engineers (USACE). 1963. Historical topographic maps (19) with water well locations identified. (ELT-prefix maps)

USACE. 1964. Site Selection (East Lynn Reservoir Twelvepole Creek, West Virginia Design Memorandum No. 2). Cincinnati, OH: U.S. Army Engineer District, Ohio River.

_____. 1965. Geology and Soils (East Lynn Reservoir Twelvepole Creek, West Virginia Design Memorandum No. 6). Huntington, WV: U.S. Army Engineer District, Huntington, 2 vols.

_____. 1968. Foundation and borrow investigation: graphic logs of borings, pits, and trenches. Cincinnatti, OH: U.S. Army Engineer District, Ohio River.

_____. 1974a. Study to evaluate the adequacy and predictive value of fish and wildlife planning recommendations at Corps of Engineers Reservoir Projects; Phase II: Individual Reservoir project evaluations reports–the East Lynn Reservoir Project, conducted by the Sport Fishing Institute. Washington, DC: Office, Chief of Engineers, U.S. Army.

_____. 1974b. Final Environmental Impact Statement (FEIS) East Lynn Lake, Twelvepole Creek, West Virginia. Huntington, WV: U.S. Army Engineer District, Huntington

_____. 1974c. Forest Management Plan. (Master Plan, appendix B). Huntington, WV: USACE Huntington District.

_____. 1977. Fish and Wildlife Management. (Master Plan, appendix D). Huntington, WV: USACE Huntington District.

_____. 1982. East Lynn Lake Report on the 1980 Sedimentation Reconnaissance, East Lynn Lake, Twelvepole Creek, Ohio River Basin, West Virginia. Cincinnati OH: USACE Ohio River Division.

_____. 1983. Department of the Army (USACE) License for fish, wildlife and forest management purposes; East Lynn Lake Project, Wayne County, West Virginia .

_____. 1984. Master Plan Update for: East Lynn Lake, Twelvepole Creek, West Virginia, Final. (Design Memorandum No. 4C). Huntington, West Virginia: USACE Huntington District.

_____. 1991. Project manual for water control management, East Lynn Lake, Beech Fork Lake (Annex II of the Drought Contingency Plan; Twelvepole Creek Basin). Huntington, West Virginia: USACE Huntington District Office.

_____. 1995. The East Lynn Lake Historic Properties Management Plan. Huntington, WV: U.S. Army Corps of Engineers.

_____. 2005. Real Estate Handbook, as amended through change 34. (Engineering Regulation 405-1-12). Washington, DC: U.S. Army Corps of Engineers.

_____. 2006a. Operational Management Plan, updated in 2006. Huntington, WV: USACE Huntington District.

_____. 2006b. East Lynn LUA/EIS kickoff meeting tour. [Presentation given at East Lynn Lake by USACE personnel]

_____. 2007a. Current Lake Conditions. Huntington, WV: USACE Huntington District. [Internet Web site]: http://www.lrh-wc.usace.army.mil/wc/distns.htm (accessed May 5, 2007).

_____. 2007b. East Lynn Lake Web site. Online: http://www.lrh.usace.army.mil/projects/lakes/elt/ (accessed April 2007).

_____. 2007c. Benthic study data (spreadsheets only). Huntington, WV: USACE Real Estate Division, Huntington District Office.

_____. 2007d. Coal Lease Applications, East Lynn Lake, Wayne County, West Virginia, Attachment to undated letter from C.S. Harlan to John Romito. Huntington, WV: U. S. Army Corps of Engineers, Real Estate Division.

_____. 2009. Department of the Army License for Fish, Wildlife and Forest Management Activities on Eaast Lynn Lake, Wayne County, West Virginia (DACW69-3-09-1016; LI-09-V150-21-R), signed January 29, 2009 by Steven B. Shideler, Chief, Real Estate Division, Huntington District, U.S. Army Corps of Engineers.

U.S. Army National Guard. 2005. PK - 12 grade schools in West Virginia. Morgantown, WV: GIS Technical Center. Online: http://wvgis.wvu.edu/data/dataset.php?action=search&ID=180 (accessed February 2007).

U.S. Bureau of Land Management. See Bureau of Land Management (BLM).

U.S. Census Bureau. 1970. Number of Inhabitants: West Virginia. http://www2.census.gov/prod2/decennial/documents/00496492v1p50ch2.pdf (accessed November 2007).

_____. 1990a. Table: Summary of General Characteristics of Persons: 1990 General Population Characteristics, West Virginia. 1990 Census of Population (CP-1-50). Online: http://www.census.gov/prod/cen1990/cp1/cp-1-50.pdf (accessed November 2007).

_____. 1990b. Summary Social, Economic, and Housing Charactersitics: West Virginia. 1990 Census of Population and Housing (CPH-5-50). Online: www.census.gov/prod/cen1990/cph5/cph-5-50.pdf (accessed November 2007).

_____. 1995. West Virginia; Population of Counties by Decennial Census: 1900 to 1990, compiled and edited by Richard L. Forstall. Online: http://www.census.gov/population/cencounts/wv190090.txt (accessed November 2007).

_____. 2000. Census 2000: Online: http://www.census.gov/prod/cen2000/dp1/2kh54.pdf (accessed June 19, 2007):

Table DP-1	Profile of General Demographic Characteristics
Table DP-2	Profile of Selected Social Characteristics
Table DP-3	Profile of Selected Economic Characteristics
Table DP-4	Profile of Selected Housing Characteristics

_____. 2001. Population Change and Distribution: 1990 to 2000. Online: http://www.census.gov/prod/2001pubs/c2kbr01-2.pdf (accessed November 2007).

_____. 2007a. American Fact Finder: Census 2000 Demographic Profile Highlights [Geographic area: by state or incorporated city: United States, West Virginia, Wayne County, Town of Wayne; and Zip Code Tabulation Areas for zip codes 25511, 25512, 25517, 25534, 25570]. (Summary File 1 (SF 1) and Summary File 3 (SF 3). Online: http://factfinder.census.gov/ (accessed June 19, 2007).

_____. 2007b. American Factfinder: Table: GCT-PH1. Population, Housing Units, Area, and Density: 2000 (Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data). Geographic areas:255 3-Digit ZCTA–5-digit ZIP Code Tabulation Area . Online: http://factfinder.census.gov/ (accessed June 19, 2007).

_____. 2007c. American Factfinder: Table QT-P1. Age Groups and Sex: 2000 (Data Set: Census 2000 Summary File 1, Matrices P13 and PCT12). Online: http://factfinder.census.gov/ (accessed June 19, 2007).

_____. 2007d. West Virginia–Urban/Rural and Inside/Outside Metropolitan Area (GCT-P1. Urban/Rural and Metropolitan/Nonmetropolitan Population: 2000; Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data). Online: http://factfinder.census.gov/servlet/GCTGeoSearchByListServlet?ds_name=DEC_2000_SF1_U&_lang=en&_ts=215191034552 (accessed December 7, 2007).

_____. 2009. Amercian Fact Finder: Census 1990 Demographic Profile Highlights by state or county. Summary Files STF-1 and STF-3. Online: http://factfinder.census.gov/ (accessed January 27, 2009).

U.S. Department of the Interior. 1999. Collection, Storage, Preservation and Scientific Study of fossils from Federal and Indian Lands. Background paper dated May 1999. Available on the web at http://www.fs.fed.us/geology/fedfos.pdf (accessed August 2007).

U.S. Environmental Protection Agency (USEPA). 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare, with an Adequate Margin of Safety. Washington, DC: USEPA Office of Noise Abatement and Control. Online: http://www.nonoise.org/library/levels74/levels74.htm

USEPA. 1999. Air Emissions Report, Criteria Air Pollutant; AirData Web site for air quality and emissions; geographic selection for Wayne County, West Virginia. Research Triangle Park, NC : USEPA Office of Air Quality Planning and Standards. Online: http://www.epa.gov/oar/data/geosel.html (accessed May 2, 2007).

_____. 2003. Draft Programmatic Environmental Impact Statement; Mountaintop Mining / Valley Fill in Appalachia. (EPA 9-03-R-00013). Environmental Assessment & Innovation Division of the Mid-Atlantic Region. Online: http://www.epa.gov/Region3/mtntop/eis.htm (accessed from January - March, 2007).

_____. 2005. Mountaintop Mining / Valley Fill in Appalachia: Final Programmatic Environmental Impact Statement (Final PEIS). Online: http://www.epa.gov/region3/mtntop/pdf/mtm-vf_fpeis_full-document.pdf (accessed from January - March, 2007).

_____. 2006. AirData, Air Monitoring Report, Criteria Air Pollutants for West Virginia, reported annually 2004-2006. From the AQS Database. Online: http://www.epa.gov/air/data/aqsdb.html (accessed May 2007).

_____. 2007a. Big Sandy Peaker Plant Envirofacts in EPA Envirofacts Warehouse. On line: http://oaspub.epa.gov/enviro/multisys2.get_list?facility_uin=110012603600 (accessed April 25, 2007).

_____. 2007b. Big Sandy Peaker Plant on EnviroMapper for Envirofacts. Online: http://134.67.99.122/enviro/emef.asp?action=zoomto&yc=38.1462&xc=-82.4262 (accessed May 1, 2007).

_____. 2007c. Cranberry Envirofacts on EnviroMapper for Envirofacts. Online: http://134.67.99.122/enviro/emef.asp?action=zoomto&yc=38.176512&xc=-82.402729 (accessed April 25, 2007).

_____. 2007d. Cranberry Pipeline Corporation on EnviroMapper for Envirofacts. Online: http://www.epa.gov/enviro/geo_data.html (accessed 1 May 2007)

_____. 2007e. Threatened and Impaired Waters List, on Clean Water Act Module (includes glossary). USEPA Watershed Academy Web. USEPA Office of Wetlands, Oceans and Watersheds. Online: http://www.epa.gov/watertrain/cwa/cwa26.htm (accessed May 6, 2007).

_____. 2007f. Air Trends, Local Air Trends, Huntington, West Virginia, 1990–2006. Online: http://www.epa.gov/airtrends/reports.html

_____. 2007g. List of contaminants and their MCLs. Drinking Water Contaminants. USEPA . Online: http://www.epa.gov/safewater/contaminants/index.html (accessed June 20, 2007).

_____. 2007h1. Envirofacts database: Rockspring Development Camp Creek Complex, County Route 28, East Lynn, West Virginia 25512-0390. Online: http://oaspub.epa.gov/enviro/multisys2.get_list?facility_uin=110006171356.

_____. 2007h2. Envirofacts database: Argus Energy WV, LLC US 52 Dunlow West Virginia 25511. Online: http://oaspub.epa.gov/enviro/multisys2.get_list?FACILITY_UIN=110007346602 .

_____. 2007i. Legacy STORET database of water-quality information.

_____. 2007j. CERCLA Hazardous Substances. Online: http://www.epa.gov/superfund/programs/er/hazsubs/cercsubs.htm (accessed September 18, 2007).

_____. 2007k. Facility/Monitor Locator Map–Criteria Air Pollutants. Data reported for carbon monoxide, nitrogen oxides, volatile organic compounds, sulfur dioxide, PM 2.5, PM 10, or ammonia. Emissions Years: 1990, 1996, or 1999. Online: http://www.epa.gov/air/data/reports.html (accessed October 10, 2007).

_____. 2007l. CERCLA Overview. Online at: http://www.epa.gov/superfund/policy/cercla.htm (accessed September 18, 2007).

_____. 2007m. Oil Program. Online at: http://www.epa.gov/oilspill/ (accessed September 19, 2007).

U.S. Fish & Wildlife Service (USFWS). 1999. Indiana bat (Myotis sodalis) revised recovery plan, Agency Draft. Ft. Snelling, MN: USFWS. 69 pp.

USFWS. 2006. Cerulean Warbler Risk Assessment & Conservation Planning Workshop Proceedings. National Conservation Training Center, Shepherdstown, West Virginia. June 12-14, 2006. Online: http://www.fws.gov/Midwest/Eco_Serv/soc/birds/cerw/cerw06ra.html (accessed August 2007).

_____. 2007a. National Wetlands Inventory Wetlands Mapper [Software]. Online: http://wetlandsfws.er.usgs.gov/wtlnds/launch.html (accessed March 2007).

_____. 2007b. National Wetlands Inventory Data Extraction [Software which supplies shapefiles of wetland polygons]. Online: http://wetlandsfws.er.usgs.gov/NWI/download.html (accessed March 2007).

_____. 2007c. Coal mining in West Virginia : guidelines for protecting the Indiana Bat (Myotis sodalis), prepared in cooperation with the West Virginia Department of Environmental Protection, West Virginia Division of Natural Resources, and U.S. Office of Surface Mining. Elkins, West Virginia: USFWS West Virginia Field Office. Online: http://www.fws.gov/northeast/nyfo/es/IndianaBatapr07.pdf
ALSO http://www.jacksonenvironmental.com/documents/IndianaBatGuidelines01-03-07.pdf (accessed May 1, 2007.)
AND http://www.wvdep.org/item.cfm?ssid=9&ss1id=934.

_____. 2007d. Species of Concern: A Conservation Action Plan for the Cerulean Warbler (Dendroica cerulea), revised version dated 30 June 2007, produced for the USFWS Division of Migratory Bird Management Focal Species Program. Fort Snelling, MN: USFWS Region 3 Ecological Services. Online: http://www.fws.gov/Midwest/eco%5Fserv/soc/birds/cerw/cerw_actionplan_30june07.html (accessed October 2007).

U.S. Forest Service (USFS). 1982. ROS [Recreation Opportunity Spectrum] Users Guide. Online: http://www.fs.fed.us/r2/trails/cdnst/carrying_capacity/rosguide_1982.pdf (accessed April 2007).

USFS. 2003. Shawnee National Forest Biological Evaluation of Regional Forester's Sensitive, Forest-Listed and other State of Illinois Listed Plant Species on the Jonesboro/Murphysboro and Vienna/Elizabethtown Ranger Districts Alexander, Gallatin, Hardin, Pope, Saline, and Union Counties for the Environmental Assessment of Commercial Equestrian Outfitter and Guide Permitting, May 15, 2003.

_____. 2005. Final Biological Evaluation on the Wayne National Forest Land and Resource Management Plan. Appendix F3 to the Final Environmental Impact Statement for the Wayne National Forest 2006 Land and Resource Management Plan), dated August 31, 2005. Wayne, West Virginia: Wayne National Forest.

U.S. Geological Survey (USGS). 2001-2005. Water resources data. (Water Supply Paper, annual publication). West Virginia. Charleston, WV: USGS. Online: http://pubs.usgs.gov/wdr/.

USGS. 2005. Faults and seismic activity, data from the U.S. Geological Survey Earthquake Hazards Program Web site. Online: http://neic.usgs.gov/neis/epic (accessed Nov.-Dec. 2006).

_____. 2006. National Elevation Dataset http://ned.usgs.gov/

_____. –2007. Water data for the nation from the National Water Information System. Online: http://waterdata.usgs.gov/nwis (accessed January 2007)

_____. 2007a. National Hydrography Dataset. Online: http://nhd.usgs.gov/index.html (through the Data tab) (accessed March 2007).

_____. 2007b. Quaternary Fault and Fold Database of the United States, data from the U.S. Geological Survey Earthquake Hazards Program Web site. Online: http://earthquakes.usgs.gov/regional/qfaults, (accessed Aug. 20, 2007).

U.S. Postal Service (USPS). 2007. East Lynn West Virginia (25512), Kiahsville West Virginia (25534), and Dunlow West Virginia (25511) Online: http://www.downloadzipcode.com (accessed May 10, 2007).

U.S. Weather Bureau. 1960. Climates of the States: West Virginia. (Climatography of the United States no. 60-64). Asheville, NC: U.S. Department of Commerce.

Waddle, Gerald. 2007. Personal communication (phone conversation) between Gerald Waddle (U.S. Office of Surface Mines) and Annette Moltzan (Project Geologist, Golder) regarding: abandoned vs. inactive mines, Sep. 13, 2007.

Ward, S. M and G. R. Crosby. 2006. Water resources data West Virginia; water year 2005. (Water-Data Report WV-05-01). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/wdr/wdrWV051.

Wayne County. 2004. Land Use Master Plan, Wayne County, WV, prepared by E.L. Robinson for the Wayne County Commissionand dated April 14, 2004. Charleston, WV: E.L. Robinson.

Wayne County Economic Development Association. 2003. [Internet Web site]: http://www.wceda.org/recreation.htm (accessed on March 4, 2007).

Wayne County News. 2007.
Wayne grad writes book about East Lynn; teen writes about home town, May 14, 2007.
Adults with low educational skills hamper W.Va. economy. July 30, 2007.
Join Us In Celebration. November 3, 2007.
Tolsia teacher killed in I-64 accident. November 8, 2007.
All Wayne schools reach full accreditation. November 17, 2007.

Wayne County Public Library. 2007. [Internet Web site]: http://www.wcpl.lib.wv.us/ (accessed November 2007).

Wayne County Sheriff's Department. 2007. [Internet Web site]: http://www.waynesheriff.net/so_1_jan_07_005.htm (accessed on March 9, 2007).

Wayne Town Police. 2007. Personal Communication with Bindi Patel (Resource Specialist, Golder) March 9, 2007.

Wendlandt, June. 2007a. Personal communication (phone) between June Wendlandt (Natural Resource Specialist, BLM) and Christy Johnson-Hughes Hughes (Senior Biologist Project Planning, USFWS)February 9, 2007, regarding: threatened and endangered species.

_____. 2007b. Personal communication (e-mail) between June Wendlandt (Natural Resource Specialist, BLM) and Mike Bellitto (Vegetation and PETS plant specialist, Golder) regarding: threatened and endangered species, with forwarded e-mail from Christy Johnson-Hughes. February 9, 2007.

West Virginia Association of Counties. 2006. [Internet Web site]: http://www.wvcounties.org/counties/wayne.html (accessed December 14, 2006).

West Virginia Coal Association (WVCA). 2006. West Virginia Coal Facts 2005. Online: http://wvcoal.com (accessed July 20, 2007)

WVCA. 2007a. West Virginia Coal Facts 2006. Charleston, West Virginia: The Association. Online: http://www.wvcoal.com/ (accessed on February 22, 2007).

WVCA 2007b. Severance Tax. Resource data online: http://www.wvcoal.com/severance_counties.html (accessed November 2007).

WVCA. 2008. West Virginia Coal Facts 2007. Charleston, West Virginia: The Association. Online: http://www.wvcoal.com/ (accessed on March 22, 2007).

West Virginia Department of Environmental Protection (WVDEP). 2001. West Virginia's monitoring strategy. Charleston, WV: WVDEP Office of Water Resources.

WVDEP. 2006a. Integrated Water Quality Monitoring and Assessment Report. [303(d) Report]. Charleston, WV: WVDEP Division of Water and Waste Management. Online: http://www.wvdep.org/Item.cfm?ssid=11&SS1ID=720 (accessed May 1, 2007).

_____. 2006b. 2005 Air Quality Annual Report. Charleston WV: West Virginia Department of Environmental Protection, Division of Air Quality. Charleston, WV: WVDEP. Online: http://www.wv.gov/Offsite.aspx?u=http://www.wvdep.org/daq. (accessed May 2, 2007).

_____. 2007. Mining Permits database. Charleston, West Virginia: WVDEP. Online: http://www.wvdep.org/WebApp/_dep/search/Permits/OMR/PermitSearchPage.cfm?office=OMR (accessed May 1, 2007).

WVDEP, Division of Waste Management. 2002. Municipal and non-municipal waste landfills and waste transfers stations (78). Morgantown, WV: GIS Technical Center. Online: http://wvgis.wvu.edu/data/dataset.php?action=search&ID=161 (accessed February 2007)

West Virginia Department of Health and Human Resources (WVDHHR). 2000. Vital Statistics 2000, http://www.wvdhhr.org/bph/oehp/vital00/index.htm#death.

West Virginia Development Office (WVDO). 2003. West Virginia Statewide Comprehensive Outdoor Recreation Plan. Online at: http://www.wvdo.org/community/08.%20Appendix%20III%20-%202003-08%20SCORP.pdf (accessed February 20, 2007).

WVDO. 2005. State of West Virginia; State Appalachian Development Plan for the Appalachian Regional Commission, prepared by the West Virginia Development Officefor Governor Joe Manchin III. Online: http://www.wvdo.org/community/06_ARC_State_Plan.pdf (accessed November 2007).

_____.2007. Economic impact of the coal mining industry in West Virginia, 2006. Spread sheet from the WVDO IMPLAN Economic Model, dated November 2007. Provided by Chuck H. Peterson, January 2008.

West Virginia Division of Forestry (WVDOF). 2002. Statewide listing of fire stations. Morgantown, WV: GIS Technical Center. Online: http://wvgis.wvu.edu/data/dataset.php?action=search&ID=179 (accessed Feb 2007).

West Virginia Division of Natural Resources (WVDNR). 2003a. Rare Threatened and Endangered Species: Indiana Myotis. Charleston, WV: WVDNR. Online: http://www.wvdnr.gov/wildlife/endangered.shtm

WVDNR. 2003b. It's about habitat; West Virginia Wildlife Conservation Action Plan. WVDNR Wildlife Resources Section. Online: http://lutra.dnr.state.wv.us/cwcp/publicparticipation1.shtm
or see http://www.wvdnr.gov/Wildlife/PDFFiles/wvwcap.pdf (.pdf version).

_____. 2005. West Virginia Big Game Bulletin. Charleston, WV: WVDNR.

_____. 2006. Five Year Summary Report of West Virginia's Reservoir Investigations: F-11-R segments (40-44) Charleston, WV: WVDNR. WVDNR. 2007a. Beech Fork State Park. Charleston, WV: WVDNR. Online: http://www.beechforksp.com/. (accessed on February 21, 2007).

_____. 2007b. Wildlife Management Areas. Charleston, WV: WVDNR. Online: (accessed May 10, 2007).

_____. 2007c. Map of State Parks and Forests. http://www.wvstateparks.com/map.html (accessed November 14, 2007).

_____. 2007d. Cabwaylingo State Forest. [Internet Web site]: http://www.cabwaylingo.com/ (accessed March 2007).

_____. 2008. East Lynn Lake Wildlife Management Area; advanced management plan, FY2008-2009, as required by the U.S. Army Corps of Engineers. Charleston, WV: WVDNR.

West Virginia GAP Analysis Project. See Strager and Strager, and others.

West Virginia Geological and Economic Survey (WVGES). 1968. State Geologic Map published in 1968 downloaded as dataset, with revisions made to digitize and georeference datum to NAD83. Scale 1:250,000. Charleston, WV: The Survey. Online: http://wvgis.wvu.edu/data/dataset.php?action=search&ID=43.

WVGES. 1969. Geologic map of West Virginia, scale 1:2,000,000. (Map 25) Charleston, WV: The Survey. Online:http://www.wvgs.wvnet.edu/www/geology/geolgeom.htm. ALSO: http://ims.wvgs.wvnet.edu/geology.htm

_____. 2003. How much gas and oil does West Virginia produce? (Number of counties with gas production) in Ask Us! Frequently Asked Questions. January. Charleston, WV: The Survey. Online: http://www.wvgs.wvnet.edu/www/faq/faq.htm#OilGas (accessed April 25, 2007).

_____. 2005a. Summary Data and Statistics; Oil and Gas Statistics –Drilling Activity Reported in 2001 (last revised: December 30, 2005). Charleston, WV: The Survey. Online: http://www.wvgs.wvnet.edu/www/datastat/datao012.htm (accessed May 6, 2007).

_____. 2005b. Homeowner's Guide to Geologic Hazards, data from the West Virginia Geological and Economic Survey Web site, page last revised: November 30, 2005. Online: http://www.wvgs.wvnet.edu/www/geohaz/geohaz3.htm (accessed Sept. 2007).

_____. 2007a. At a Glance–Wayne County. Charleston, WV: The Survey. Online: http://www.wvgs.wvnet.edu/www/geology/geolwayn.htm (accessed April 25, 2007).

_____. 2007b. Ask Us! Frequently Asked Questions, Oil and Gas. Charleston, WV: The Survey. Online: http://www.wvgs.wvnet.edu/www/faq/faq.htm#OilGas (accessed May 3, 2007).

_____. 2009. Coal bed methane wells reported to WVGES (last updated March 24, 2008). Charleston, WV: The Survey. Online: http://www.wvgs.wvnet.edu/www/datastat/cbm/cbm.asp (accessed March 18, 2009).

West Virginia Health Care Authority. 2004. Hospital locations of the state of West Virginia. Morgantown, WV: GIS Technical Center. Morgantown, WV: GIS Technical Center. Online: http://wvgis.wvu.edu/data/dataset.php?action=search&ID=176 (accessed February 2007).

West Virginia Native Plant Society. 2007. Wildflower Survey of East Lynn Lake. Provided by the U.S. Army Corps of Engineers on February 9, 2007.

West Virginia Office of Miners' Health, Safety and Training (WVMHST). 2006. 2005 Coal Production by County. Online: http://www.wvminesafety.org/cnty2005.htm. (accessed on March 4, 2007).

West Virginia. Office of the Secretary of State. 2007. Historical Election Results. http://www.wvsos.com/elections/history/results/electionresults.htm (accessed November 2007).

West Virginia State Addressing and Mapping Board (WVSAMB). 2003. Digital natural color orthophotography for the State of West Virginia. Morgantown, WV: GIS Technical Center. Online: http://wvgis.wvu.edu/data/dataset.php?action=search&ID=254 (accessed September 2006).

West Virginia State Budget Office. 2000. [Internet Web site]: http://www.wvbudget.gov/ (accessed November 2007).

West Virginia State Fire Marshal Office. 2007. [Internet Web site]: http://www.wvfiremarshal.org/fd2001.htm. (accessed on March 9, 2007).

West Virginia State GIS Technical Center. 1998. Karst regions derived from 1968 geological map of West Virginia, scale: 1:250,000. Morgantown, WV: West Virginia University Department of Geology & Geography. Online: http://wvgis.wvu.edu/data/dataset.php?action=search&ID=133 (accessed May 4, 2007).

West Virginia State Police. 2007. Personal Communication with Bindi Patel (Resource Specialist, Golder). March 09, 2007.

West Virginia State Tax Department. 2005. Coal Processing and Severance Tax. Publication TSD-210, revised January 2005. http://www.state.wv.us/taxrev/taxdoc/tsd210.pdf, (accessed January 22, 2009).

West VirginiaUniversity. 2000. Karst data set. Morgantown, WV: GIS Technical Center. Online: http://wvgis.wvu.edu/data/dataset.php?action=search&ID=133.

West VirginiaUniversity, Bureau of Business and Economic Research. 2007. West Virginia County Data Profiles. Online: http://www.be.wvu.edu/bber/data_profiles.htm (accessed November 2007).

West VirginiaUniversity, Regional Research Institute. 2005. West Virginia Population Estimates and Projections. Online: http://www.rri.wvu.edu/wvpop4.htm. (accessed on February 12, 2007).

Wetzel, Kim L and J.M. Bettandorff. 1986. Techniques for estimating streamflow characteristics in the Eastern and Interior coal provinces of the United States. (Water Supply Paper 2276). Washington, DC : U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/wsp/wsp2276.

Wetzel, Kim L. and Scott A.Hoffman. 1989a. Summary of Surface Water Quality Data, Eastern Coal Province, October, 1978 to September, 1982. (OFR 83-940). Washington, DC: U.S. Geological Survey.

_____. 1989b. Distribution of water-quality characteristics that may indicate the presence of acid mine drainage in the eastern coal province of the United States. (Hydrologic Atlas HA-705). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/ha/ha705.

White, Jeremy S. and Melvin V. Mathes. 2006. Dissolved-gas concentrations in ground water in West Virginia , 1997-2005. (Data Series 156). Washington, DC: U.S. Geological Survey. Online: http://pubs.usgs.gov/ds/2005/156/.

Wiley, J. B., R. D. Evaldi, J. H. Eychaner, and D. B. Chambers. 2001. Reconnaissance of stream geomorphology, low streamflow, and stream temperature in the mountaintop coal-mining region, southern West Virginia, 1999-2000. (Water Resources Investigation 2001-4092). Washington, DC: U.S. Geological Survey.

Willis, William. 2007a. Personal communication between Bill Willis (Wayne CountyCommission, EMS Manager) and Elizabeth Duvall (Project Co-manager, Golder) regarding: cellular phone towers and utility corridors in the vicinity of the USACE East Lynn Lake Project, May 1 and 3, 2007.

_____. 2007b. Personal communication between Bill Willis (Wayne County Commission, EMS Manager) and Elizabeth Duvall (Project Co-manager, Golder) regarding: hazardous material spills in the vicinity of the USACE East Lynn Lake Project, October 19, 2007.

Wilson, M.W. 1979. Drainage areas of the Twelvepole creek basin, West Virginia ; Big Sandy River basin, West Virginia ; Tug Fork basin, Virginia, Kentucky, West Virginia. (Open File Reports 76-746). Washington, DC: U.S. Geological Survey.

Workforce West Virginia (WWV). 2007. Wayne County Profile (Workforce Investment Area 2). http://www.wvbep.org/bep/LMI/wia/wia2.htm (accessed May 10, 2007)

World Bank Group. 1998. Industry Sector Guidelines: Coal Mining and Production, in Pollution Prevention Abatement Handbook. Washington, DC: World Bank Group, pp. 282-285. Online: http://www.ifc.org/ifcext/enviro.nsf/Content/PPAH#Glossary (accessed May 2007)

Wyrick, Granville G. and James W. Borchers. 1981. Hydrologic effects of stress-relief fracturing in an Appalachian valley. (USGS Water-Supply Paper 2177). Washington, DC: U.S. Geological Survey. Online: http://pubs.er.usgs.gov/usgspubs/wsp/wsp2177.

Yoksoulian, Lois E. 2006. From the bottom to the Top: Preliminary Report on the Origin and Conditions of Kimberlite Ascent and Emplacement–Focus on Diamond Survivability (Elliott County Kimberlite, KY), in Geological Society of America Abstracts with Programs, Southeastern Section–55th Annual Meeting (23-24 March 2006), vol. 38(3): p. 73.

CHAPTER 8
GLOSSARY

303(d) list)—se*e impaired waterways.*

-A-

acre-foot (ac-ft)*--the volume of water required to cover 1 acre of land (43,560 square feet) to a depth of 1 foot. Equal to 325,851 gallons or 1,233 cubic meters.*

adaptive management*–the concept that adjustments are made to improve effectiveness and reduce impacts, as the decisions and actions are implemented, based on continuous monitoring. This approach is especially useful where there is uncertainty about impacts, either due to lack of knowledge, changing technology, or changing conditions.*

affected environment*–in the NEPA process, the area that will be affected or created by the alternatives under consideration.*

air conformity analysis*–conformity to an implementation plan means: (1) complying with an implementation plan's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards, and achieving expeditious attainment of such standards; and (2) assuring that such activities will not: (a) cause or contribute to any new violation of any standard in any area; (b) increase the frequency or severity of any existing violation of any standard in any area; or (c) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. The 1990 amendment to the Clean Air Act [section 176(c)] requires each Federal agency to demonstrate that every decision or action it takes will comply with applicable air quality requirements.*

alluvial*–pertaining to material or processes associated with transportation or deposition of soil and rock by flowing water.*

alluvium*–sediment deposited by water, including gravel, sand, silt, and clay, in various mixtures.*

all-terrain vehicle (ATV) –*See Off-road vehicle (ORV)*

angle of draw*–in coal mine subsidence, this angle of draw describes the angle required to reach the point where subsidence becomes negligible and identifies the width of the measurable subsidence. It is generally assumed to bisect the angle between the vertical and the angle of repose of the material and is 20 degrees for flat seams. For dipping seams, the angle of break increases, being 35.8 degrees from the vertical for a 40 degrees dip. The main break occurs over the seam at an angle from the vertical equal to half the dip.*

anticline*–a fold in the geologic strata that is convex upward with the older rocks toward the center of the curvature.*

aquatic species or wildlife*–animals and plants, that are dependent on water for at least a portion of their life cycles. Compare to terrestrial species or wildlife.*

aquifer –*a water-bearing bed or porous rock. The rock, often sandstone, is sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs. When people drill wells, they tap water contained within an aquifer.*

assemblages*– naturally occurring group of plant and animals inhabiting a common environment that interact with each other; see ecological communities*

-B-

bench –*normally a long, narrow, relatively level ledge or gently inclined strip of land bounded by steep slopes above and below, and formed by differential erosion of rocks and soils that are bedrock controlled. In mining, one or more divisions of a coal seam separated by slate or formed as coal is extracted.*

best management practice (BMP) –*one or more practices designed to prevent or reduce pollution or another negative effect on a resource.*

biological assessment (BA) –*information prepared by, or under the direction of, a federal agency to determine whether a proposed action is likely to: (1) adversely affect listed species or designated critical habitat; (2)*

jeopardize the continued existence of species that are proposed for listing; or (3) adversely modify proposed critical habitat.

biological diversity –*the variety of life in an area, including the variety of genes, species, plant and animal communities and ecosystems, and the interaction of these elements. See habitat diversity. The term is often abbreviated to biodiversity.*

bituminous–*a medium soft class of coal, used primarily for electric generation and for coke making in the steel industry. Bituminous is the most useful type of coal and most commonly mined in the U.S.*

blow out–*sudden releases of water from flooded mine workings.*

bone–*a layer of hard, impure coal which sometimes grades uniformly into the adjacent softer coal and sometimes is sharply separated from it. Bone is usually a mixture of clay shale particles with the coal.*

British thermal unit (BTU) –*a measure of the energy required to raise the temperature of one pound of water one degree Fahrenheit. On average, coal contains 25 million BTUs per ton.*

buffer –*an area of land between two separate and distinct land use regimes, which can serve to modify the effects of one land use on the other.*

-C-

candidate species–*plant and animal taxa considered for possible addition to the List of Endangered and Threatened Species. These are taxa for which the Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions.*

carbonaceous –*rock or sediment that is rich in organic matter.*

channery–*a thin, flat rock fragment of limestone or sandstone, up to 6 inches in diameter.*

channel scouring–*the downward erosion caused by stream water in removing material (such as, soil, rocks) from a channel bed or bank or around in-channel structures.*

clean recoverable tons–*includes the coal that would be processed and cleaned for shipping to a buyer. The number does not include coal that would be left in place as pillars or to protect structures.*

climate –*the characteristic weather of a region, particularly temperature and precipitation, averaged over some significant interval of time.*

climatic –*refers to formation or effects in the environment resulting from or influenced by climate.*

coal seam–*a bed or stratum of coal. The term is usually applied to a large deposit of coal.*

colluvial –*pertaining to material or processes associated with transportation and/or deposition by mass movement (gravitational action) and local, unconcentrated runoff on side slopes and/or at the base of slopes.*

colluvium –*unconsolidated, unsorted earth material accumulated by gravitational slope movement or sheet wash processes*

community*–in ecology, the collection of species that characteristically occur together under a specified set of conditions. Often, the term is used to refer only to vegetation. See also* ***ecoregion****.*

condition index–*weighted average expressing the current overall condition of a resource or asset.*

consumptive use–*use of a resource that reduces its supply, such as logging, mining, and water use. Contrast with non-consumptive use.*

contour –*a line drawn on a topographic map connecting points of the same elevation.*

conventional mining–*this type of mining involves the insertion of explosives into the coal seam, blasting of the seam and removal of the coal onto a conveyor or shuttle car by loading machine. Once the most common form of deep mining, conventional mining now accounts for only a small proportion of overall coal production.*

cooperating agencies– a *Cooperating Agency assists the lead Federal agency(ies) in developing an EIS. The CEQ regulations implementing NEPA define a Cooperating Agency as any agency that has jurisdiction by law or special*

expertise for proposals covered by NEPA (40 CFR 1501.6). Any Federal, State, local, or tribal government agency with such qualifications may become a Cooperating Agency on an EIS by agreement with the lead Federal agency.

Council on Environmental Quality (CEQ)–*an advisory to the President, established by the National Environmental Policy Act of 1969. The CEQ reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.*

critical habitat –*areas formally designated for the survival and recovery of federally listed threatened or endangered species.*

cultural resource –*the remains of sites, structures, or objects used by people in the past; they can be identified as historical or pre-historic.*

-D-

debris flow –*a moving mass of rock, soil and mud; it is usually slow moving.*

deep mine–*an underground mine.*

demonstrated reserve base– *Coal deposits, which are potentially mineable on an economic basis with existing technologies.*

developed recreation –*Recreation that takes place at defined areas where constructed facilities are provided for such use. Developed recreation sites include campgrounds, picnic areas, boat ramps, and interpretive sites. Contrast with dispersed recreation.*

direct effects (economics) –*are those generated by the industry itself. See also* ***indirect effects*** *and* ***induced effects****.*

dispersed recreation –*Recreation that takes place in primitive settings where few, if any, constructed facilities are provided. Trail use, rock climbing, boating., hunting., and fishing are examples of dispersed recreation. Contrast with developed recreation.*

disturbance*–Any relatively discrete event in time that disrupts ecosystem, community or population structure; and changes resources, substrate availability, or the physical environment.*

down-cutting–*The eroding of a stream downward in its channel, resulting in the lowering of the streambed relative to the top of the bank.*

draft environmental impact statement (DEIS)–*The draft version of an environmental impact statement that is released to the public and other agencies for review and comment.*

drift –*Horizontal or nearly horizontal passageway in a mine running through or parallel to a vein or seam, or a secondary mine passageway between two main shafts or tunnels.*

drift mine–*A coal mine entered directly through a horizontal opening drilled into the side of a hill or mountain. This mining method is used in hilly or mountainous areas.*

-E-

ecology–*1. The interrelationships and interconnectedness of living things to one another and to their environment. 2. The study of these interrelationships and interconnections.*

ecological communities*– naturally-occurring group of plant and animals inhabiting a common environment that interact with each other; see assemblages*

ecoregion*–An area over which the climate is sufficiently uniform to permit development of similar ecosystems on sites that have similar properties. Ecoregions contain many landscapes with different spatial patterns of ecosystems.*

ecosystem–*An arrangement of biotic and abiotic components and the forces that move among them.*

ecosystem management–*An ecological approach to natural resource management to assure productive, healthy ecosystems by blending social, economic, physical, and biological needs and values. See ecological* approach.

endangered species –*A plant or animal species that is in danger of extinction throughout all or a significant portion of its range. Endangered species are identified by the Secretary of the Interior/Secretary of Commerce in accordance with the Endangered Species Act of 1973.*

environmental analysis–*1. An analysis of actions and their predictable long and short-term environmental effects. Environmental analyses include consideration of physical, biological, social, and economic factors. 2. a general term that could refer to an environmental assessment or an environmental impact statement.*

environmental assessment (EA) –*a briefer version of an environmental impact statement, prepared when it is uncertain whether the environmental effects associated with a proposal are significant. See environmental impact statement.*

environmental impact statement (EIS) –*a disclosure statement revealing the environmental impacts of a proposed action, which is required for major federal actions under Section 102(2)(C) of the National Environmental Policy Act. A draft EIS is released to the public and other agencies for review and comment. The statement provides full and fair description of significant environmental impacts and informs the decision maker and the public of the reasonable alternatives, which would avoid or minimize adverse impacts or enhance the quality of the human environment.*

environmental justice –*Executive Order 12898, enacted by President Clinton in 1993, requires that each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.*

ephemeral stream –*a watercourse that may or may not have a well-defined channel, and which flows only for short periods during and following precipitation. Ephemeral stream bottoms are usually above the water table and do not contain fish or aquatic insects with larvae that have multi-year life cycles. Contrast with intermittent stream and perennial stream.*

erosion –*the wearing away of the earth's surface by running water, wave action, moving ice and wind, or processes of mass wasting chemical processes. Geologic erosion refers to natural erosion processes occurring over long (geologic) time spans. Accelerated erosion generically refers to erosion in excess of what is presumed or estimated to be naturally occurring levels, and which is a direct result of human activities.*

evapotranspiration –*a combined term for water vapor lost from soil or an open water surface (evaporation) and from plants, mainly via the stomata (transpiration). The combined term is used since in practice it is very difficult to determine levels of water vapor resulting from evaporation versus transpiration.*

-F-

face –*the exposed area of a coalbed from which coal is extracted.*

facies–*the set of all characteristics of a sedimentary rock that indicate its particular environment of deposition.*

formation–*the basic unit for the naming of rock in stratigraphy.*

fault–*a fracture in rock units along which there has been displacement.*

fauna –*the collective animal life of an area.*

federally listed species (PETS) species–*See listed species.*

first mining only-- *This method removes approximately 50 percent of the coal and leaves the other 50 percent in pillars that hold up the roof of the mine. What remains after mining is a system of open "rooms" and coal pillars.*

fisheries habitat –*streams, lakes, and reservoirs that support fish, or have the potential to support fish.*

floodplain–*1. The nearly level plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of streams. 2. At a minimum, an area subject to a one percent or greater chance of flooding in any given year.*

flora–*the collective plant life of an area.*

footslopes–*lower part of a hillslope that merges with the alluvial plain. The footslope forms the inner, gently inclined surface at the base of a slope. In profile, footslopes are commonly concave and are situated between the backslope and a toeslope.*

foreground –*in scenery management, the detailed landscape generally found within one-half mile of the observer.*

-G-

game species–*Animal species that are hunted, trapped, or fished for sport, financial gain, or food under state or federal laws, codes, and regulations.*

geochemistry –*the study of the chemical species, reactions, and processes in soils and rocks and their interactions with atmosphere, surface water, and groundwater.*

geographic information system (GIS) –*1. a database designed to handle geographic data. 2. A set of computer operations that can be used to analyze geographic data. Also referred to as computerized mapping.*

geomorphic process –*a process that changes the form of the earth, such as volcanic activity, running water, or glacial action.*

geomorphology –*the science that deals with the relief features of the earth's surface.*

goal*–in planning, a concise statement that describes a desired future condition to be achieved with no specific date by which it is to be attained. It is normally expressed in broad, general terms. Goal statements form the principal basis from which objectives are developed.*

graben*–A elongated block of rock between two geologic faults (that are dipping toward the elongated block) and where the block has moved downward to form a depression between the two adjacent fault blocks.*

groundwater*. –the supply of fresh water under the earth's surface in an aquifer or in the soil.*

-H-

habitat –*the physical and biological environment for a plant or animal species in which all the essentials for its development, existence, and reproduction are present.*

habitat capability –*the ability of a land area or plant community to support a given species of wildlife.*

habitat diversity –*the diversity of wildlife habitat types within a given area. See biological diversity.*

habitat diversity index–*a measure of improvement in habitat diversity.*

heritage resources –*the remains of sites, structures, or objects used by people in the past; this can be historical or pre-historic.*

hydraulic conductivity–*A measure of the capacity for a rock or soil to transmit water; generally has the units of feet/day or cm/sec. See also* ***permeability****.*

hydraulic gradient–*The slope of the hydraulic grade line. This is the slope of the water surface in an open channel, the slope of the water surface of the groundwater table, or the slope of the water pressure for pipes under pressure.*

hydrogeology –*the science that deals with subsurface waters and with related geologic aspects of surface waters.*

hydrologic balance –*the relationship between the quality and quantity of water inflow to, water outflow from, and water storage in a hydrologic unit (such as a, drainage basin, watershed aquifer, soil profile, lake, or reservoir). The term encompasses the dynamic relationships among precipitation, runoff, and changes in ground and surface water storage.*

hydrologic unit code (HUC)–*See watershed level.*

hydrology–*the science dealing with the study of water on the surface of the land, in the soil and lying under rocks, and in the atmosphere.*

-I-

impaired waterways–*each state, approved tribe, or territory maintains a list of waterbodies or segments of waterbodies that do not meet water quality standards. This list is called the "303(d) list," named after the section of the Clean Water Act that requires regulatory authorities to create such lists. The 303(d) list includes not only currently impaired waterbodies but also waters believed to be threatened that are likely to become impaired (i.e., not meet water quality standards) by the time the next 303(d) list is due. The USEPA sets the water quality standards and guidelines for the 303(d) lists.*

indicator group*– a subgroup that is studied to reveal the occurrence of disturbance. In biodiversity, the indicator group makes it possible to approximation the richness of a species.*

indirect effects (economic*)–indirect effects account for the impact of the industry and its employees spending money in the state. See also* ***direct effects*** *and* ***induced effects****.*

induced effects (economic)–*induced effects represent the impacts of new household income created by direct and indirect spending.See also* ***direct effects*** *and* ***indirect effects****.*

in-stream flow*–refers to the presence of stream flow adequate to maintain the integrity of the stream channel and protection of downstream beneficial uses such as fish and wildlife habitat needs, recreational uses of water, and livestock watering needs.*

intermittent stream *–a stream that flows in response to a seasonally fluctuating water table in a well-defined channel. The channel will exhibit signs of annual scour, sediment transport and other stream channel characteristics, absent perennial flows. Intermittent streams typically flow during times of elevated water table levels and may be dry during significant periods of the year, depending on precipitation cycles. Intermittent streams do not maintain fish populations or aquatic insects that have larvae with multi-year life cycles. Contrast with ephemeral stream and perennial stream.*

invasive species *–a species that can move into an area and become dominant either numerically or in terms of cover, resource use, or other ecological impacts. An invasive species may be native or non-native.*

-K-

karst*–topography characterized by sinkholes, caves, and streams that disappear underground. It results from the action of surface and underground water in soluble rock such as limestone.*

kimberlite–*a magmatic rock that occurs in volcanic pipes. The rock is most famous as a host of diamonds, although not all Kimberlites contain diamonds****.***

KYOVA–*the KYOVA Interstate Planning Commission is an association of local governments in southwestern West Virginia and southern Ohio that serves as a forum for assessing and acting upon regional transportation problems. Under federal law, KYOVA is the "metropolitan planning organization" (MPO) responsible for ensuring wise and coordinated use of federal/state transportation funds within the metropolitan statistical area (MSA).*

-L-

ladder fuels *–fuels that provide vertical continuity between the ground and tree crowns, thus creating a pathway for a surface fire to move into the tree crowns*

land cover types– *the type of vegetation that is on the ground surface, such as: hardwood forest, oak dominant forests, and northern forest types*

land use planning*– the process of organizing the use of lands and their resources to best meet people's needs over time, according to the lands' capabilities.*

landscape*–a large land area composed of interacting ecosystems that are repeated due to factors such as geology, soils, climate, and human impacts. Landscapes are often used for coarse grain analysis.*

lignite*– the softest class of coal, with the highest moisture content. It is mined primarily in the western U.S. and used for some electric generation and conversion to synthetic gas.*

linear utilities *–utilities that occur along line, such as power or electrical lines, telephone lines, and water and gas pipelines.*

listed species*– refers to one or more species listed by the U.S. Fish and Wildlife Service as endangered (E), threatened (T) or proposed for federal listing as threatened or endangered (P). Also referred to as PET species, or a subset of the species defined as PETS species.*

long-term effect*s–those effects, which will usually occur beyond the next ten years.*

longwall mining*–longwall mining employs a steel plow or rotating drum, which is pulled mechanically back-and-forth across a face of coal that is usually several hundred feet long. The loosened coal falls onto a conveyor for removal from the mine. Longwall operations include a hydraulic roof support system that advances as mining proceeds allowing the roof to fall in a controlled manner. Longwall operations are the fastest growing underground mining technique, highly productive, and generally improves mine safety. West Virginia is the leading longwall mining producer in the U.S.*

lycopod *–ancient, extinct type of plant.*

-M-

main*– main haulage drift in a mine.*

mean slope–*average slope on a given hillslope. See the definition of slope.*

mesic*–refers to moist to moderately moist soil conditions. Under mesic conditions, soil moisture is predictably adequate for plant growth during the growing season.*

mesophytic*– of or adapted to a moderately moist environment.*

metropolitan planning organization (MPO)*– intergovernmental agency responsible for ensuring wise and coordinated use of federal/state transportation funds within the metropolitan statistical area (MSA).*

metropolitan statistical area (MSA)*–geographic entities defined by the U.S. Office of Management and Budget (OMB) for use by federal statistical agencies in collecting, tabulating, and publishing Federal statistics. Though other names have been used since these statistical units were established in 1949, the term MSA (1990) is used to describe "an area containing a recognized population nucleus and adjacent communities that have a high degree of integration with that nucleus…to provide nationally consistent definitions for collecting, tabulating, and publishing Federal statistics for a set of geographic areas." (from the Census Bureau standards published in 2000). As of June 6, 2000, there are 362 metropolitan statistical areas*

mineral soil *–soil that consists mainly of inorganic material, such as weathered rock, rather than organic matter.*

mineralogy*– the science of mineral formation, occurrence, properties, composition, and classification.*

Mississippian Age*–a period of the Paleozoic era thought to have covered the span of time between 345 and 320 million years ago.*

mitigation *–collective actions taken to avoid, minimize, or rectify the negative impact of a land management practice.*

monitoring–*repeated observation of conditions especially to detect and give warning of change or to verify compliance.*

multiplier effect–w*hen one economic activity in a community results in indirect or induced socioeconomic benefits in that community or in the wider region*

-N-

National Historic Landmark (NHL)–*cultural properties designated by the Secretary of the Interior as being nationally significant. These cultural properties may be buildings, historic districts, structures, sites, and objects that possess exceptional value in commemorating or illustrating the history of the United States.*

National Register of Historic Places *–the official federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture.*

native species *–species that is within its known historical range, and there is no evidence of humans having artificially introduced it. Any species indigenous to a given land or water area by natural occurrence.*

natural resource*–a feature of the natural environment that is of value in serving human needs.*

***NEPA process**–based on the* National Environmental Policy Act of 1969 *(NEPA) (42 U.S.C. 4321 et seq.) to insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment.*

***No Action alternative–**a required alternative in an EIS or EA, it describes the most likely condition expected to exist in the future if management practices cease or continue without change. Provides a basis (point of reference) for describing the environmental effects of the proposed action and other alternatives.*

No Action Scenario (NAS)**--activities that can reasonably be expected to occur associated with the No Action alternative. See also **reasonably foreseeable development scenario (RFDS).

***non-compliant coal**– coal that will not meet the standards set by the Environmental Protection Agency for the amount of SO_2 emissions allowed from coal-fired power plants. Some coal beds that are high in sulfur content are not mined because that coal must be cleaned or blended with higher quality coal to meet individual contract specifications or emissions standards.*

***non-consumptive use**–the use of a resource that does not reduce its supply. For instance, bird watching is a non-consumptive use of a wildlife resource. Boating and fishing are non-consumptive uses of water resources. See consumptive use.*

***nongame species**–any species of wildlife or fish that is ordinarily not managed or otherwise controlled by hunting, fishing, or trapping regulations.*

***non-native species**–an introduced species that evolved elsewhere, and that has been transported and disseminated purposefully or accidentally.*

***non-point source pollution**–pollution of water from diffuse sources and which cannot be traced to a single point of origin. For example, water pollutants that result from agriculture, forestry, urban, mining, and construction projects, and are generally carried off the land by storm water runoff into waterways.*

***non-renewable resource**–a resource whose total quantity does not increase measurably over time, so that each use of the resource diminishes the supply.*

***Notice of Intent (NOI)** –a notice in the Federal Register that an environmental impact statement will be prepared and considered.*

-O-

***objective** –in planning, a concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.*

***ordinary high water mark**– the line on the shore established by the fluctuation of water, and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter, debris, or other appropriate means that consider the characteristics of the surrounding area.*

***off-highway vehicle (OHV)**–See Off-road vehicle (ORV)*

***off-road vehicle (ORV)** –any motorized recreational vehicle capable of being operated off an established road. This includes all-terrain vehicles (ATVs), motorcycles, rail buggies, 4-wheel-drive pickup trucks, dirt bikes, and snowmobiles.*

***organic soil**– soil that is at least partly derived from living matter, such as decayed plant material.*

***outgrant**–land owned by the USACE that is leased to another party. Examples of outgrants include easement, licenses and permits.*

***outstanding mineral rights**–the rights to extract subsurface minerals that are retained by the owner of those minerals, when ownership of the surface of the land (by another party) is transferred to the federal government.*

***outcrop**–where the seam is visible at the surface, it is said to "outcrop" or to be "an outcrop."*

***overburden**–rocks and soil lying above an economic resource (for example a coal bed). Overburden is removed prior to surface mining.*

-P-

***panel–**a coal mining block that generally comprises an operating unit.*

***parent material**–the mineral or organic matter from which the upper layers of soil are formed.*

***pedological** –relating to pedology, which is the study of soil.*

***Pennsylvanian age**–a period of the Paleozoic era thought to have covered the span of time between 320 and 280 million years ago.*

***perched water body** –an unconfined aquifer separated from the lying under water table by an impermeable or unsaturated zone.*

***percolation** –downward flow or infiltration of water through the pores or spaces of rock or soil.*

***perennial stream** –any watercourse that generally flows most of the year, in a well-defined channel and below the water table, although droughts and other precipitation patterns may influence the actual duration of flow. It contains fish or aquatic insects that have larvae with multiyear life cycles, and water-dependent vegetation is typically associated with it. Contrast with ephemeral stream and intermittent stream.*

***permeability** –the ability of a material to allow the passage of a liquid, such as water through rocks. Permeable materials, such as gravel and sand, allow water to move quickly through them, whereas unpermeable material, such as clay, don't allow water to flow freely. Permeability is reported in units of millidarcies (mD). Sometimes used for hydraulic conductivity.*

***PETS species**– the inclusive group of federally Proposed, Endangered and Threatened species, and Sensitive species.*

***photolineaments**–a natural linear feature on the land surface that has been identified from aerial photographs or other images.*

***pillar**–an area of coal left to support the overlying strata in a mine; sometimes left permanently to support surface structures.*

***porosity**–the ratio of the volume of voids in the soil to the total volume of the mass or solids, expressed as a percentage.*

***portal** –structure surrounding the entrance to a mine or the mouth of a tunnel.*

***pre-existing use** –a land use that may not conform to a current zoning ordinance but which existed prior to the enactment of the ordinance.*

***productivity** –the ability of an area to provide goods and services or to function ecologically.*

***proved reserves–** estimates of the amount of oil or natural gas believed to be recoverable from known reservoirs under existing economic and operating conditions.*

***property line–**1. a land ownership division line between two parcels of land. 2. a separation of real property rights.*

***proposed species**– species proposed for federal listing as threatened or endangered under provisions of the Endangered Species Act of 1973. For Proposed, Threatened and Endangered Species, see PETS.*

***public involvement** –in planning, the use of appropriate procedures to inform the public, obtain early and continuing public participation, and consider the views of interested parties in planning and decision making.*

***public land–**land for which title and control rests with a government, at the federal, state, regional, county, or municipal level.*

-Q-

quartzose sandstone–*sedimentary rock that contains quartz as a principal constituent.*

Quaternary age*– the most recent geologic time period, spanning 1.8 million years ago to the present. Sometimes called the "Age of Man."*

-R-

raptor–*predatory bird, such as a falcon, hawk, eagle, or owl.*

reach*–stream segment*

reasonably forseeable development scenario (RFDS)*- a generic mining plan that describes the coal mining activities that can reasonably be expected to occur associated with the proposed action.*

recharge–*the addition of water to groundwater by natural or artificial processes.*

reclamation *–the restoration of land and environment after the coal is extracted. Reclamation operations are usually underway where the coal has already been taken from a mine, even as mining operations are taking place elsewhere at the site. The process commonly includes recontouring or reshaping the land to its approximate original appearance, restoring topsoil and planting native grasses and ground covers. Reclamation is closely regulated by both state and federal law, and the coal industry's outstanding effort in this area has resulted in millions of acres of restored productive land throughout the country.*

record of decision (ROD) *–in planning, the official document in which a deciding official states the alternative that will be implemented from a prepared environmental impact statement.*

recoverable reserves –*the amount of coal that can be recovered from the demonstrated reserve base.*

rehabilitation *–the process of repairing damage done to the ecosystem or a part of it, such that natural processes will again function in the repaired system. Contrast with restoration.*

reserve *–the portion of the identified coal resource that can be economically mined. The reserve is derived by applying a recovery factor to that component of the identified coal resource designated as the reserve base.*

reserved mineral rights–*the rights to extract subsurface minerals that are retained by a landowner, when ownership of the surface of the land is transferred to the federal government. Basic standards for conducting mineral operations are inserted into the deed held by the private owner of the minerals.*

residuum *–unconsolidated, weathered, or partly weathered mineral material that accumulates by disintegration of bedrock in place.*

resilience–*the ability of an ecosystem to maintain diversity, integrity, and ecological processes following a disturbance.*

resource management plan (RMP)–*the document that guides the management of a particular federal resource and establishes management standards for all lands controlled by that agency.*

restoration*– the process of modifying an ecosystem to achieve a desired, healthy, and functioning condition. Contrast with rehabilitation.*

retreat mining*– in mine-and-pillar mining, workers remove as much coal as possible from the remaining pillars until the roof falls in. When retreat mining is completed, the mined area is abandoned.*

revegetation*– the re-establishment and development of a plant cover by either natural or artificial means, such as re-seeding.*

rill erosion*– the removal of soil through the cutting of many small, but conspicuous, channels where runoff concentrates.*

riparian area*– a three-dimensional ecotone of interaction between terrestrial and aquatic ecosystems, which extends down into the groundwater, up above the canopy, outward across the floodplain, up the near-slopes that drain to the water, laterally into the terrestrial ecosystem, and along the watercourse at a variable width.*

***room-and-pillar mining**.–most underground coal is mined by the room-and-pillar method. In room and pillar mining, approximately half of the coal is left in place to support the roof of the active mining area. Rooms, generally 20-30 feet wide cut into the coal bed leaving a series of pillars which can be up to 100 feet wide. As mining advances, a grid-like pattern of rooms and pillars is formed. When mining advances to the end of a panel or the property line, retreat mining begins. There are two types of room-and-pillar mining: conventional mining, the oldest method, accounts for only about 12 percent of underground coal output; and continuous mining, the most prevalent form of underground mining, accounts for 56 percent of total underground production.*

***runoff–**the portion of precipitation that flows over the land surface or in open channels.*

***run-of-mine coal–** coal as it comes directly from the mine before it is treated at a preparation plant.*

-S-

***sacred site**–any specific, discrete, narrowly delineated location on federal land that is identified by a tribe or Native American individual determined to be an appropriately authoritative representative of a Native American religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Native American religion; provided that the tribe or appropriately authoritative representative of an Native American religion has informed the agency of the existence of such a site (Executive Order 13007). Examples include: places that figure in a tribe's traditions about its origins and interactions with the supernatural, places where religious rituals are customarily carried out or sites representing ancestral living places or cemeteries often thought of as archeological sites.*

***sandstone**–sedimentary rock containing dominantly sand-size particles. Sedimentary rock consists of quartz sand united by some cementing material, such as iron oxide or calcium carbonate.*

***scenic attractiveness**– the scenic importance of a landscape based on human perceptions of the intrinsic beauty of landform, rockform, waterform, and vegetation pattern. Reflects varying visual perception attributes of variety, unity, vividness, intactness, coherence, mystery, uniqueness, harmony, balance, and pattern. It is classified as: Distinctive Typical or Common Undistinguished.*

***scoping**–in planning, the ongoing process to determine public opinion, receive comments and suggestions, and determine issues during the environmental analysis process. Scoping involves public meetings, telephone conversations, letters, or other communication methods.*

***seam**– a bed or stratum of coal. Usually applies to a large deposit.*

***sediment**–material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by water, wind, ice or mass-wasting and has come to rest on the earth's surface.*

***sedimentary rock–**a rock formed by the accumulation and cementation of mineral grains transported by wind, water, or ice to the site of deposition or chemically precipitated at the depositional site.*

***seep** –an area where groundwater slowly flows, or seeps, out of rock face. The wet area is found where a seasonal high water table intersects with the ground surface.*

***sensitive species**–those plant and animal species for which population viability is a concern, as evidenced by (1) significant current or predicted downward trends in population numbers or density; or (2) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.*

***severed**–a mineral that is removed from the resource base or mined.*

***shaft–** the main entry or access to a deep mine is by means of a vertical shaft. It is used for ventilation, drainage and/or hoisting personnel and materials.*

***shale**–a very fine-grained sedimentary rock composed of clay, silty clay, or silty clay loam deposit and that tends to split into thin layers.*

***sheet erosion** –essentially the uniform removal of soil from an area without the development of conspicuous water channels. The channels are tiny or tortuous, exceedingly numerous, and unstable; they enlarge and straighten as the volume of runoff increases.*

***short-term effects**–in planning, those effects that usually occur within ten years.*

significant heritage resource*–an archeological site or historic property that meets the criteria for eligibility for inclusion on the National Register of Historic Places.*

siltstone*– sedimentary rock containing dominantly silt-size particles or fragments of sediment or rock, produced by mechanical weathering of a larger rock mass.*

sink hole*–a depression, mostly circular in shape, in a karst area. Its drainage is subterranean and is commonly funnel shaped.*

slickenside–*polished and striated surfaces, formed by friction, often indicating a fault plane or landslide*

slope *–the description of the tilt of a line; rise over run. The measure of the slope is expressed in degrees or as a percentage. For example, a rise of 2 meters over a distance of 100 meters describes a 2 percent slope with an angle of 1.15.*

slope stability*–the susceptibility of a slope to erosion and landslides.*

slump *–a mass movement process characterized by a landslide involving a shearing and rotary movement of a generally independent mass of rock and earth along a curved slip surface.*

soil compaction*–a reduction of soil volume, which results in alteration of soil chemical, physical, and biological properties and qualities.*

soil depth*–the distance from the top of the soil to the lying under bedrock. The depth is expressed as one of the following categories: shallow, 0-20 inches; moderately deep, 20-40 inches; deep, 40-60 inches; or very deep, more than 60 inches.*

soil health*–the soil's current condition relative to its inherent capacities. A healthy soil is one whose capacity to perform its functions is not impaired, or not lower than its inherent or "natural" capacity.*

soil mapping unit*–a collection of individual soil areas or miscellaneous areas delineated in a soil survey and identified on a map by a unique symbol. Comparable map units in adjoining survey areas are similar.*

soil productivity*–the potential capability of a soil to supply the physical, chemical, and biological needs of plants over the long-term, as influenced by climate, parent materials, topographic on the landscape (including aspect), and land use history.*

soil quality*– 1. a soil's inherent or "natural" capacities to perform its functions to sustain productivity.*
2. the capacity of a soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental quality and promote plant and animal health.

soil survey–*the systematic examination, description, classification, and mapping of soils in an area.*

soil texture–*the relative proportions of sand, silt, and clay in a soil.*

springs*– areas where groundwater flows out of the ground and collects in a pool or flows into a channel.* The *source of the water is located where water begins to flow from the ground due to the intersection of the water table with the ground surface. Springs generally flow throughout the year.*

steep and mountainous land *–in planning, lands exceeding a 45 percent slope gradient.*

strata*–basic unit of lithologic stratigraphy*

stratigraphy*–the chronological sequence or order of rock or soil layers in a geologic formation.*

stream order*–a categorization of a stream according to its size. Stream order increases incrementally, with the order increasing with stream size, when one stream flows into a stream of equal or greater size. For example, first order streams are unbranched and usually found at the head of drainage basins. Second order streams are formed when two first order streams come together.*

stipulations*–a restriction that is insisted upon as a condition for an agreement.*

stress-relief fractures–*fractures resulting from the removal of compressional stress on lying under rocks by erosion of overlying rocks, results in a predictable fracture pattern in valleys*

strike and dip*–a geological phrase used to describe fault planes. Strike is the direction or trend taken by a structural surface, such as a bedding or fault pane, as it intersects the horizontal. Dip is the angle that a structural surface, such as a bedding or fault plane, makes with the horizontal, measured perpendicular to the strike of the structure and in the vertical plane.*

sub-bituminous*–class of coal between bituminous and lignite, with low fixed carbon and high volatility and moisture.*

subsidence*–the process of sinking or settling of a land surface or a crustal elevation because of natural or artificial causes such as mining or groundwater withdrawal. In areas where mining is common, the sinking can be gradual or sometimes an abrupt collapse of the rock and soil layers into and underground mine. Surface features and structures may be affected*

submain–*tributary haulage drift in a mine.*

surface mine–a *mine where the coal is near the surface and can be extracted by removing the overburden.*

sustainability*–the ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time.*

syncline–*in geology, a fold in the strata that is convex downward with the younger rocks toward the center of the curvature.*

-T-

tailwaters–*water below a dam.*

terrace *–a step-like or raised surface, bordering a valley floor or stream, that represents the former position of a flood plain.*

terrestrial species or wildlife*– ground-dwelling plants and animals. Compare to aquatic species or wildlife.*

threatened species*–a plant or animal species likely to become endangered throughout all or a specific portion of their range within the foreseeable future, as designated by the Secretary of the Interior or the Secretary of Commerce under the Endangered Species Act of 1973.*

threshold*–the point at which a stimulus is of sufficient intensity to begin to produce an effect*

tiered to*–indicates that the document incorporates by reference other, broader documents and general statements, concentrating solely on the issues specific to the site.*

toe slope*–the hill slope position that forms the gently inclined surface at the base of a hill slope. Compare to footslope.*

ton*–in standard American measurement, a ton is equal to 2000 pounds. A British ton (or long ton) is 2240 pounds, and tonne (metric) is 1000 kg (2205 pounds).*

topographic*– 1. Pertaining to topography. 2. A type of map that indicates topographic contours.*

topography*–the general configuration or shape of the earth's surface, including its relief or elevation, and the position of its natural features.*

total dissolved solids (TDS) – *the concentration of solids that can pass through a 0.45-micron filter media.*

trace fossils*– structures preserved in sedimentary rocks that record biological activity (for example: footprints).*

transmissivity*– the rate at which water passes through an aquifer, usually expressed as distance over time (for example xft/yday)*

-U-

unsuitability criteria*–criteria found at 43 CFR 3461.5 information addressing the suitability for certain methods of coal mining, or even if mining should occur.*

use, allowable*.–an estimate of proper range use. Forty to fifty percent of the annual growth is often used as a rule of thumb on ranges in good to excellent condition. It can also mean the amount of forage planned to accelerate range rehabilitation.*

-V-

vadose zone*–also termed the unsaturated zone, is the portion of earth between the land surface and the phreatic zone or zone of saturation ("vadose" is Latin for "shallow"). It extends from the top of the ground surface to the water table.*

visual resource*–a part of the landscape important for its scenic quality. It may include a composite of terrain, geologic features, or vegetation.*

-W-

waste *–rock or minerals removed from a mine that have no value.*

water table*– the upper surface of groundwater. Below the water table, the soil is saturated with water.*

water yield*– the runoff from a watershed, including groundwater outflow.*

watershed *–the land area drained by a river or stream, may also be called a drainage basin. The watershed includes the network of streams, sloughs and creeks that contribute to a river system and may encompass a number of smaller watersheds that ultimately combine at a common point.*

watershed level or hydrologic unit code (HUC)*–a cataloging system developed by the U.S. Geological Survey and the Natural Resource Conservation Service to identify watersheds, and to standardize hydrological unit delineations for geographic description and data storage purposes. They are typically reported at the large river basin or smaller watershed scale.*

wetland*–area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include, for example, swamps, marshes, bogs, and similar areas.*

wildlife-associated recreation*– recreation closely associated with one or more wildlife species. Wildlife-associated recreation is often divided into consumptive use or non-consumptive use of the resource (for example, hunting and fishing versus wildlife watching). See consumptive use and non-consumptive use.*

-X-

xeric*–refers to very dry soil conditions. Under xeric conditions, soil moisture is predictably inadequate for plant growth during the growing season.*

CHAPTER 9
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Terms found in the Glossary (chapter 8) are in bold italics

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