United States Department of the Interior
Bureau of Land Management

Environmental Assessment
for the
West Elk Coal Lease Modifications Application

Uncompahgre Field Office
2465 S. Townsend Ave.
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DOI-BLM-CO-150-2012-13-EA

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BLM

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U.S. Department of the Interior
Bureau of Land Management

ENVIRONMENTAL ASSESSMENT

EA-NUMBER: DOI-BLM-CO-150-2012-13-EA

PERMIT/LEASE NUMBER: COC-1362 and COC-67232

PROJECT NAME: West Elk Mine Coal Lease Modifications

LEGAL DESCRIPTION:

Lease Modification Tract Location Acreages		
Lease Modification Tract	**Location**	**Acreage**
COC-1362	T. 14 S., R. 90 W., 6th P.M. • Sec. 10: SE, NESW; • Sec. 11: SW, S2NW; • Sec. 14: NWNW, NENW, W2SENW, SWNW, • NWSW, W2NWSW; • Sec. 15: E2NE, N2SE	Approximately 800 acres
COC-67232	T. 14 S., R. 90 W., 6th P.M • Sec. 11: SWNE, W2SE;SESE • Sec. 14: E2SENW, NE, SE, S2SW, E2NESW; • Sec. 15: SESE; • Sec. 22: E2NE; • Sec. 23: NW, NWNE	Approximately 921 acres

APPLICANT: Mountain Coal Company

Chapter 1

1.1 Introduction:

This preliminary Environmental Assessment (EA) has been prepared in response to the request by the Mountain Coal Company (MCC or the "Proponent") to modify existing Federal coal leases at the West Elk Mine. The West Elk Mine is located 1 mile east of the community of Somerset on the south side of State Highway 133, and approximately 10 miles east of the town of Paonia, in Gunnison County, Colorado.

The Proponent is applying to add approximately 800 acres to lease COC-1362 and approximately 921 acres to lease COC-67232 for a total of approximately 1,721 acres. MCC

applied for the two coal lease modifications, which are immediately adjacent to their existing Federal coal leases at the West Elk Mine, so that they can continue to mine and sell compliant and super-compliant coal. The West Elk Mine holds approximately 14,395 acres of Federal coal leases, and approximately 3,656 acres of fee coal lands. MCC is in the process of mining E-Seam reserves in existing portions of COC-1362 and COC-67232 leases.

The West Elk Mine is permitted by the State to produce up to 8.5 million tons of coal and coal-refuse annually. The West Elk Mine has been in operation since 1982, and produced approximately 6 million tons of coal in 2011. The Proposed Action or Proposed Action Alternative would both constitute an expansion of that original mine, continuing mining operations into an additional area. However, neither the Proposed Action nor Proposed Action Alternative would increase annual production beyond previously authorized limits.

1.2 BLM's Purpose/Need for the Proposed Action:

Purpose:

The BLM purpose is to decide whether to accept the coal lease modifications as applied for by MCC, reject the applications, or modify the proposed lease modifications.

Need:

The need is to respond to a request to modify existing leases in accordance with the requirements of the Mineral Leasing Act of 1920 (MLA) and the Mineral Leasing Act for Acquired Lands of 1947 (MLAAL), the Federal Coal Leasing Act Amendments of 1976 (FCLAA), the Federal Land Policy and Management Act of 1976 (FLMPA), National Environmental Policy Act of 1969 (NEPA), the Energy Policy Act of 2005, 43 CFR 3400, and all other applicable laws, rules, regulations, standards, policies, and guidelines. The BLM is required to facilitate the recovery of known Federal coal reserves; to make Federal coal reserves accessible for development; and to foster and encourage the orderly development of domestic coal reserves.

1.3 Land Use Plan Conformance:

The Proposed Action and the Proposed Action Alternative were reviewed for conformance (43 CFR 1610.5, BLM 1617.3) with the following plan:

Name of Plans: Uncompahgre Basin Resource Management Plan (RMP)

Date(s) Approved: 1989 (BLM)

Results: The RMP made provisions for coal leasing subject to the application of the 20 Coal Unsuitability Criteria (as established in 43 CFR 3461). Federal coal lands not meeting the standards required by each criterion are determined to be unsuitable for coal leasing. A number of criteria have exemptions and exceptions, and the application of these exemptions and exceptions may allow certain types of coal mining.

1.4 Other Related NEPA Documents:

The following NEPA documents were previously prepared for actions at the West Elk Mine, or other coal mines in the North Fork Valley. They inform the analysis in this EA.

1) Box Canyon Federal Coal Lease EA and DN (Decision Notice), 1995. Document relates to cumulative effects.

2) Raven Gulch Coal Exploration License EA and DN and Finding of No Significant Impact (FONSI), 1998. Document relates to cumulative effects.

3) Iron Point Exploration License, the Iron Point Coal Lease Tract and the Elk Creek Coal Lease Tract Environmental Impact Statement ("North Fork Coal EIS") and Record of Decision. March 30, 2000. Document relates to cumulative effects.

4) Coal Lease Modifications for Federal Coal Leases C-1362 and COC-56447 EA and DN, 2001. Document relates to cumulative effects.

5) Coal Methane Drainage Project NEPA analyses and related decisions: Decision Memos from 2001; Panel 15 Methane Drainage Wells EA and DN/FONSI, 2001; Panels 16 to 24 EA and DN/FONSI, 2002; Sylvester Road Temporary Road Construction and Box Canyon Methane Drainage Wells EA and DN/FONSI, 2003. Document relates to cumulative effects.

6) West Flatiron Federal Coal Lease EA and DN/FONSI, 2003. Document relates to cumulative effects.

7) Dry Fork Coal Lease-by-Application Final EIS, 2005 and Record of Decision, 2006. Document relates to cumulative effects and effects analysis on parent lease COC-67232.

8) Sylvester Gulch/Long Draw Supplemental EA and DN/FONSI, 2006. Document relates to cumulative effects.

9) Deer Creek Shaft and E Seam Methane Drainage Wells Project FEIS August 2007 Records of Decision August 2007 (Shaft), November 2007, March 2008 and Errata January 2008. Documents relate to cumulative effects, methane capture and existing condition of the affected parent leases.

Incorporated by Reference

Additionally, this EA incorporates by reference the United States Forest Service (USFS) Draft EIS, Federal Coal Lease Modifications COC-1362 & COC-67232 (available for public comment until July 9, 2012, and can be found at: http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/68608_FSPLT2_126547.pdf). This USFS Draft EIS analyzes the impacts that would be

associated with the USFS consent decision to modify federal coal leases COC-1362 and COC-67232, and includes all relevant stipulations from the parent leases. The relevant sections (and USFS Draft EIS page numbers) concerning surface and other ground-disturbance related impacts from the proposed lease modifications are described below:

- Topographic & Physiographic Environment (pp. 77-80): If the No Action Alternative is selected, the coal resource in the proposed lease modification areas would not be mined and the topography of the area would remain unchanged except for natural processes. If the lease modifications are approved, the act of leasing would cause no topographic change in the area. However, subsequent underground longwall mining would cause approximately 2,400 acres of subsidence in and around the lease modification area.

- Geology (pp. 80-83): If the No Action Alternative is selected, the coal resource in the proposed lease modification areas would not be mined and the structural and lithologic integrity of the modification areas would remain in place. If the lease modifications are approved, the overburden (including existing geologic structure and lithologic continuity) would be altered by subsidence due to the collapse of material into the void caused by extraction of coal. However, due to the thickness of the overburden in the lease tract, and the absence of bedrock cliffs, it is anticipated that evidence of subsidence would not easily be seen by casual observers. Additionally, mining of the coal could result in methane loss within the coal bed and recoverability of any gas resource present in geologic formations in and/or above the coal seams could be reduced due to the evacuation of gas through mine ventilation.

- Soils (pp.83-87): If the No Action Alternative is selected, the coal resource in the proposed lease modification areas would not be mined and the soil conditions would exist in their current state affected only by ongoing natural processes and other existing land uses. If the lease modifications are approved, impacts to the soil resource from subsidence would include cracks – these cracks tend to self-heal due to sloughing and natural filling by soil material. Additionally, if the lease modifications are approved and subject to the Colorado Roadless Rule, surface use of approximately 73 acres could occur due to access roads, methane drainage, and related activities. Previous surface disturbance in the area has been revegetated between two and five years after reclamation work is completed.

- Watershed (pp. 87-93): If the No Action Alternative is selected, there would be no mining-induced effects on water resources in the modification area. Current ongoing activities in the watershed as well as natural variation in spring, seep, and stream flow would continue to occur based on climatic variations. If the lease modifications are approved, subsidence may alter surface water and groundwater hydrology by altering groundwater flow regimes, surface water drainages, seeps, and ponds.

- Vegetation (pp. 94-98): If the No Action Alternative is selected, vegetative conditions would continue as they currently exist as modified by other actions in the area discussed in the cumulative effects discussion. If the lease modifications are approved, subsidence may result in impacts to vegetation from minor landslides; however, the likelihood of vegetative loss due to subsidence is minimal. Additionally, if the modifications are approved and subject to the Colorado Roadless Rule, the roads and

well pads that would be placed in the modification areas would result in a complete loss of existing vegetation. However, the vegetative habitat would only be removed in the short and mid-term and pursuant to the parent lease stipulations would be revegetated.

- Threatened and Endangered Species (pp. 98-105): The only listed species with habitat in the proposed lease modification area is the Canada lynx. If the No Action Alternative is selected, there would be no change to current habitat or population conditions of the Canada lynx. If the lease modifications are approved, it is not anticipated that there would be any habitat loss due to subsidence. However, if the lease modifications are approved and subject to the Colorado Roadless Rule, the surface impacts due to road construction and well pad development would result in the following potential effects to lynx:
    - Short-term direct effects of habitat loss / alteration
    - Short-term direct effects from disturbance to denning or foraging
    - Short-term direct effects of mortality from traffic or shooting
    - Impacts from changes in winter access (competition and disturbance)
    - Long-term direct effects as a result of changes in vegetation, which provides denning and foraging habitat

- Sensitive Species (pp. 105 – 118): The sensitive wildlife species found in the GMUG forest with known habitat, or known or potential sightings are: the American marten, Pygmy shrew, Northern goshawk, Boreal owl, Olive-sided flycatcher, Flammulated owl, Hoary bat, Northern leopard frog, and Purple martin. Under the No Action Alternative, there would be no coal mined in the proposed lease modifications and therefore no impact to species apart from existing natural conditions and other projects in the species habitat areas. If the lease modifications are approved, there would be the potential for habitat impacts due to subsidence; however, this is unlikely. Additionally, if the lease modifications are approved and subject to the Colorado Roadless Rule, there would be impact to habitat due to road construction and well pad development. These impacts would be short, mid and long-term, but there would be no permanent impact to species due to the stipulations to mitigate impacts and reclaim the habitat areas.

- Sensitive Plants (pp. 118-119): There are two Forest Service sensitive plant species known to occur or likely to occur in the project area: Rocky Mountain thistle and Colorado tansy-aster. If the No Action Alternative is selected, there would be no short-term changes to habitat or population conditions of sensitive plant species. Long-term changes would be dependent on existing natural conditions and other actions in the habitat areas. If the lease modifications are approved, there would also be no detrimental impact to habitat or population conditions. The Colorado tasty-aster has not been documented in the project area; however, if populations were encountered they would be avoided or have other mitigation implemented. If the lease modifications are approved and subject to the Colorado Roadless Rule, there would likely be a beneficial impact to the Rocky Mountain thistle because of the creation of possible disturbance areas suitable for propagation.

- Management Indicator Species (pp. 119-124): A complete list of GMUG Management Indicator Species (MIS) is presented in Appendix 2 of the Biological Evaluation. The three MIS analyzed in the Draft EIS are: Elk, Merriam's wild turkey, and Red-napped

sapsucker. If the No Action Alternative is selected, there would be no short-term habitat impact for any of the three species and the long-term changes would continue to be dependent on natural conditions and other actions in the habitat areas. If the lease modifications are approved and are subject to the Colorado Roadless Rule, the following potential effects to each species are:

- Elk:
  - Short-term direct effects during construction (visual or auditory disturbance or displacement of individuals from machinery, vehicles and humans)
  - Long-term direct effects as a result of changes in forage and cover
  - Long-term indirect effects as a result of changes in human use in the area
- Merriam's wild turkey:
  - Short-term direct effects during construction (visual or auditory disturbance or displacement of individuals from machinery, vehicles and humans)
  - Short-term direct mortality of eggs/nests during construction activities.
  - Long-term direct effects as a result of changes in forage and cover
  - Long-term indirect effects as a result of changes in human use in the area
- Red-naped sapsucker:
  - Short-term effects of disturbance during construction
  - Short-term potential for loss of young during construction
  - Long-term changes to habitat

- Migratory Birds (pp. 124-126): Table 3.26 of the USFS Draft EIS lists all bird species of conservation concern in the Southern Rockies/Colorado Plateau region. If the No Action Alternative is selected, there would be no current habitat or population changes to any bird species. If the lease modifications are approved, the act of leasing itself will have no impact on bird species. However, post leasing development may impact some species protected under the Migratory Bird Treaty Act and parent lease stipulations require surveys and timing restrictions where necessary for certain species.

- Range Resources (pp. 126-128): If the No Action Alternative is selected, existing grazing would continue in the area without change and range management practices would continue to be implemented on an annual basis. If the lease modifications are approved, subsidence-induced ground movements would have the potential to damage stock ponds, fences, or stock trails if surface tension cracks form where these features are present. However, these potential impacts are unlikely. Additionally, if the lease modifications are subject to the Colorado Roadless Rule, road and drill pad construction could interrupt grazing rotations, damages fences, and/or reduce forage. The USFS Draft EIS Table 3.27b summarizes potential range impacts from post-lease development.

- Recreation (pp. 128-129): If the No Action Alternative is selected, current recreation uses and activities would continue and there would be no impact on any recreation uses. If the lease modifications are approved, there would be no impact on recreation use from subsidence. However, if the lease modifications are subject to the Colorado Roadless Rule, the presence of drill rigs and heavy equipment could impact the recreational opportunities in the modification areas. These impacts would be short-term and have no permanent impact on the recreation uses of the area.

- Transportation (pp. 129 – 132): If the No Action Alternative is selected, no additional impacts on the transportation system would be expected. On-going effects related to methane drainage drilling would continue to occur on CR 710/NFSR 710 and NFSR 711 until project completion. If the lease modifications are approved, there would not be an increase in impacts to local traffic from MCC employees. Additionally, it is very unlikely that there would be any subsidence related impacts to roads. If the lease modifications are subject to the Colorado Roadless Rule, there would be increased traffic on NFSR 710 and the possible need to upgrade the road due to the need for over-sized vehicles (such as drill rigs for MDWs) to access the area.

- Roadless (pp. 132-144): As of the date of availability for the USFS Draft EIS, the 2001 Roadless Rule is in effect and includes the lease modification areas which are in the West Elk Inventoried Roadless Area (IRA). The 2001 Roadless Rule prohibits any new road construction in IRAs (there are limited exceptions to this prohibition however none apply to the lease modifications analyzed in the USFS Draft EIS). In 2005, a new Roadless Rule was enacted which allows individual states to petition for state specific roadless rules. Both the 2001 and 2005 Roadless Rules have been the subject of extensive litigation, but currently neither is enjoined and both are in full force and effect. The State of Colorado has petitioned for a state specific roadless rule and the Final EIS analyzing the Colorado Roadless Rule was released on May 2, 2012. The Colorado Roadless Rule prohibits new road construction in Colorado Roadless Areas (CRAs); however, it includes an exception that allows for temporary road construction associated with mining in the North Fork Coal Area. The lease modification areas analyzed in the USFS Draft EIS are within the Sunset CRA and the North Fork Coal Area. Therefore, if the lease modifications are approved and subject to the Colorado Roadless Rule, construction of 6.5 miles of temporary roads would be allowed in order to drill MDWs.

  If the No Action Alternative is selected, no temporary roads would be constructed and there would be no associated impacts. If the lease modifications are approved and subject to the 2001 Roadless Rule, there would be no temporary road construction allowed in the West Elk IRA to drill MDWs and such wells would have to be drilled using alternative methods (helicopters, directional drilling, etc.). If the lease modifications are approved and subject to the Colorado Roadless Rule, temporary road construction would be allowed in the Sunset CRA. Impacts associated with road construction would be temporary and the area would be restored to baseline conditions following the mining of coal in the modification areas.

- Heritage Resources (pp.144-145): There are no inventoried cultural resources in the modification areas. If the No Action Alternative is selected, there would be no effect to historic properties. If the lease modifications are approved, any post-lease mining activities would be subject to the requirement of lease stipulations relating to cultural resources and there would be no impact to historic properties.

- Visuals (pp. 145-147): If the No Action Alternative is selected there will be no visual impacts from mining in the lease modification areas – any visual impacts in the area will result from other activities and natural conditions. If the lease modifications are approved, the visual impacts in the area would be limited because underground access

to the coal resource would be through the existing West Elk Mine. Any subsidence that may result from mining would likely not cause any readily visible impact. If the lease modifications are approved and subject to the Colorado Roadless Rule, there would be no visual impacts to nearby public roads or Wilderness Areas.

1.5 Scoping and Public Involvement and Issues:

The United States Forest Service - Grand Mesa Uncompahgre Gunnison (USFS GMUG), as the responsible Surface Management Agency (SMA), prepared a Notice of Opportunity to Comment in relation to the Proposed Action. The Notice of Opportunity to Comment was published in *the Grand Junction Daily Sentinel* (the newspaper of record) and in the *Delta County Independent* on April 21, 2010. The Notice of Opportunity to Comment asked for public comment on the proposed lease modifications from April 21, 2010 through May 21, 2010. In addition, as part of the public involvement process, the GMUG sent out approximately 120 letters to local, State, Native American Tribal, and other Federal agencies; as well to interested parties, commercial entities, and environmental and user groups. The GMUG also posted scoping materials to their website, as well as to their Schedule of Proposed Actions.

During the comment period, approximately 684 versions of email form letters were received from Wild Earth Guardians and their supporters;1,900 versions of email form letters were received from Defenders of Wildlife and their supporters; 23,771 versions of email form letters were received from the Natural Resources Defense Council and their supporters; 5,647 versions of email form letters were received from Earth Justice and their supporters; 576 hardcopy/faxed form letters were received from local community members in four Colorado Counties; 74 original (or somewhat original) comments were received; and four original comments with attachments were received in response to this scoping effort.

For the preparation of this EA, the BLM interdisciplinary (ID) Team prepared a list of key issues, within the jurisdiction of the agency, to be addressed in this EA (see Table 1 - BLM/Key Issues below).

Table 1 - BLM Key Issues

Topic	Issue	Where Addressed
Air Quality	Effects of the Proposed Action and Proposed Action Alternative may occur on air quality including ambient ozone, PM2.5, PM10, VOCs, Class I areas in compliance with the Clean Air Act.	Chapter 3
	Cumulative effects to air quality associated with coal burning may occur as a result of the Proposed Action and Proposed Action Alternative.	Chapter 3
Socioeconomics	Coal mining activities are vital to the local and regional economies.	Chapter 3
	Coal from the North Fork Valley helps fuel clean coal technology and provide the USA with low-cost, reliable energy.	Chapter 3
Climate Change	Effects on climate change may occur	Chapter 3

Table 1 - BLM Key Issues		
Topic	**Issue**	**Where Addressed**
	from mining coal which stem from the release of methane through the mine ventilation system, release of methane through any gob vent boreholes and release of CO2 caused by the burning of coal that is mined.	
Methane	Consider alternatives to venting including flaring, capture and use, or destroying ventilation air methane (VAM).	Chapters 2 and 3
Evaluation of Impacts	Evaluate the direct, indirect and cumulative impacts of the Proposed Action and Proposed Action Alternative.	Chapter 3
Reasonably Foreseeable Actions	Consider lease action with other reasonably foreseeable actions in North Fork Valley.	Chapter 3

Chapter 2 – Alternatives and Proposed Action

2.1 Description of Proposed Action and Alternatives:

2.1.1 No Action Alternative

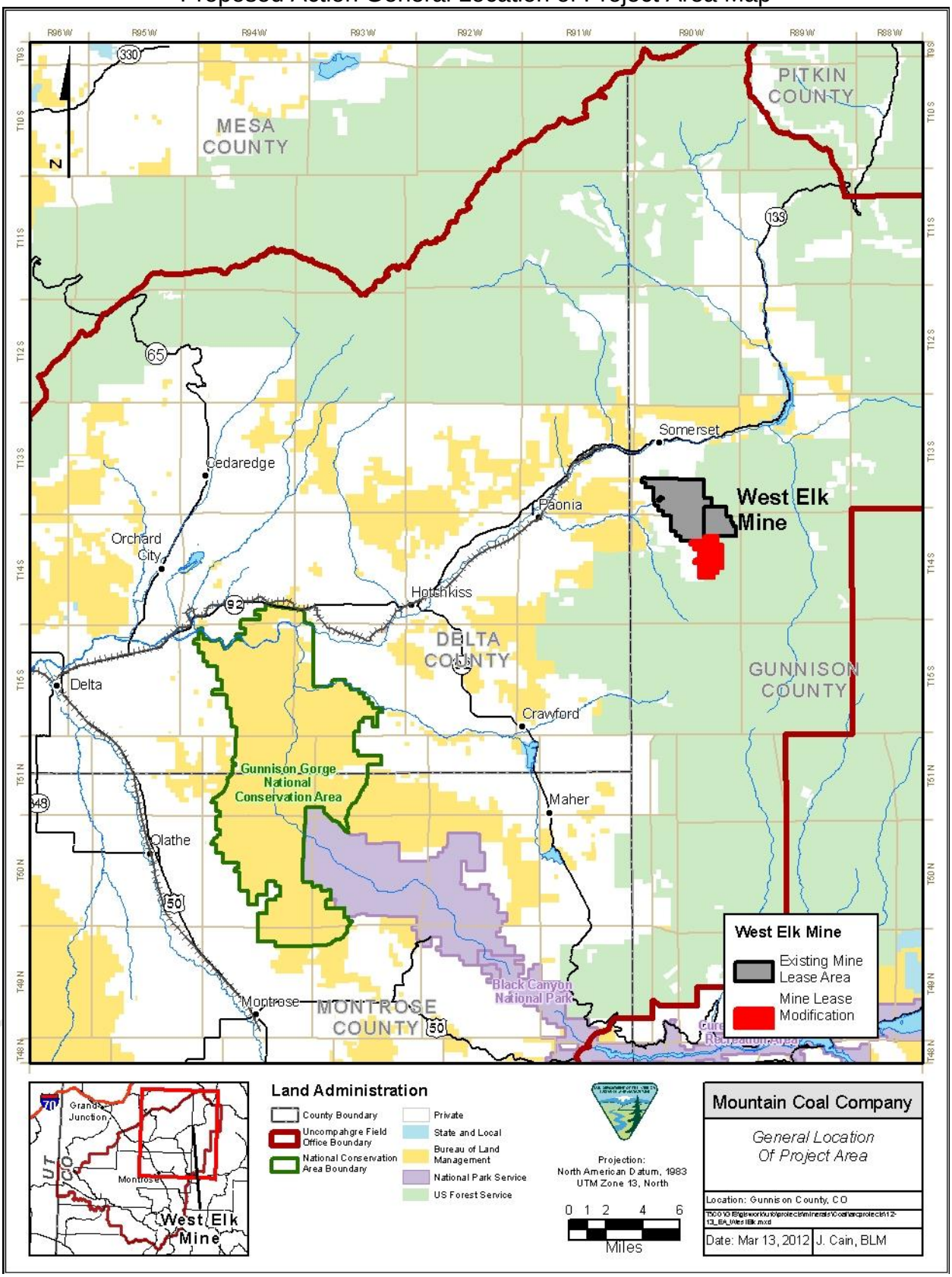
In accordance with Council on Environmental Quality (CEQ) regulations, which require a No Action Alternative be presented in all environmental analyses in order to serve as a "base line" or "benchmark" from which to compare all proposed "action" alternatives, the No Action Alternative is analyzed in this EA.

Under the No Action Alternative, the Proponent's request for the coal lease modifications would not be approved. The Federal coal reserves in the lease modification areas would be bypassed by the current mining operation.

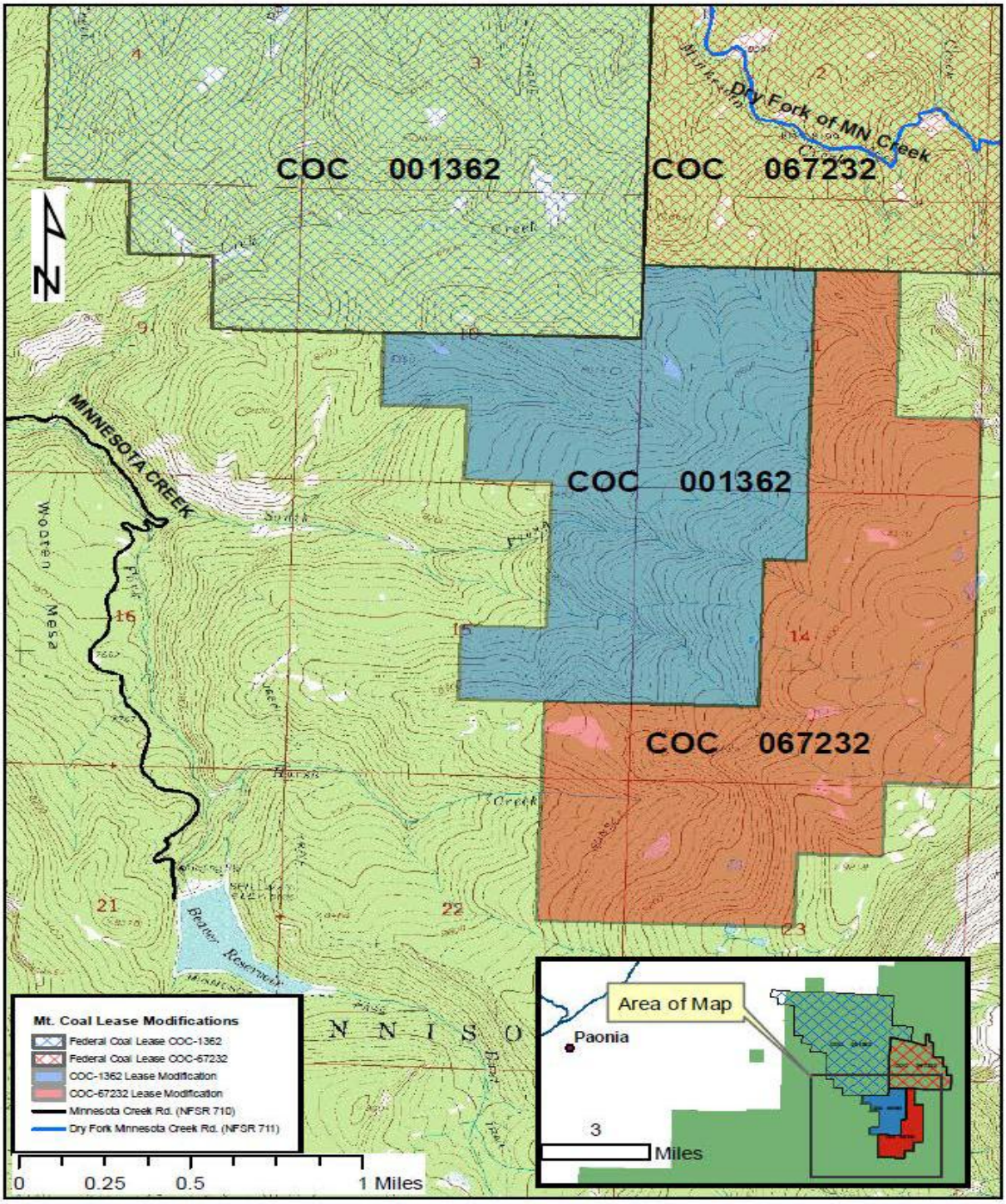
2.1.2 Proposed Action Alternative

The Proponent, MCC, is requesting to modify existing Federal coal leases at the West Elk Mine (see Proposed Action Location Map on next page). The Proposed Action, as proposed by MCC, is to add approximately 800 acres to lease COC-1362 and approximately 921 acres to lease COC-67232 for a total of approximately 1,721 acres. Associated methane drainage well installation, and the foreseeable land disturbance includes an additional 73 acres (approximately) of disturbance for 48 additional methane drainage wells and access routes. Under the Proposed Action Alternative, if the BLM receives consent from the USFS, the BLM would issue the lease modifications subject to USFS stipulations attached to the parent leases (see Appendix B) and pursuant to the lease addendums.

Proposed Action General Location of Project Area Map



Proposed Action Location Map



BLM Design Features/Mitigation Measures

Methane Flaring, Capture/Use or other Alternatives to Venting

Lease Addendum Carried Forward from Parent Lease COC-1362 and Parent Lease COC-67232 Specific to Forest Service Lands:

Sec. 3. Notwithstanding the language in Sec.2 of this lease and subject to the terms and conditions below, lessee is authorized to drill for, extract, remove, develop, produce and capture for use or sale any or all of the coal mine methane from the above described lands that it would otherwise be required to vent or discharge for safety purposes by applicable laws and regulations. For purposes of this lease, “coal mine methane” means any combustible gas located in, over, under, or adjacent to the coal resources subject to this lease, that will or may infiltrate underground mining operations. Sec. 4. Notwithstanding any other provision of this lease, nothing herein shall, nor shall it be interpreted to, waive, alter or amend lessee’s right to vent, discharge, or otherwise dispose of coal mine methane as necessary for mine safety or to mine the coal deposits consistent with permitted underground mining operations and federal and state law and regulation. Lessee shall not be obligated or required to capture for use or sale coal mine methane that would otherwise be vented or discharged if the capture of coal mine methane, independent of activities related to mining coal, is not economically feasible or if the coal mine methane must be vented in order to abate the potential hazard to the health or safety of the coal miners or coal mining activities. In the event of a dispute between lessor and lessee as to the economic or other feasibility of capturing for use or sale the coal mine methane, lessor’s remedy as a prevailing party shall be limited to recovery of the compensatory royalties on coal mine methane not captured for use or sale by lessee. Lessee shall have the right to continue all mining activities under the lease, including venting coal mine methane, pending resolution of any dispute regarding the application of the terms of Sections 3 and 4. Sec. 2 (c) COAL MINE METHANE OPERATIONS AND ROYALTIES Notwithstanding the language in Part II, Section 2 (a) of this lease, the royalty shall be 12.5 percent of the value of any coal mine methane that is captured for use or sale from this lease. For purposes of this lease, the term “capture for use or sale” shall not include and the royalty shall not apply to coal mine methane that is vented or discharged and not captured for the economic or safety reasons described in Part I, Section 4 of this lease. Lessee shall have no obligation to pay royalties on any coal mine methane that is used on or for the benefit of mineral extraction at the West Elk coal mine. When not inconsistent with any express provision of this lease, the lease is subject to all rules and regulations related to Federal gas royalty collection in Title 30 of the Code of Federal Regulations now or hereinafter in effect and lessor’s rules and regulations related to applicable reporting and gas measurement now or hereinafter in effect.

SEVERABILITY- In the event any provision of this addendum is subject to a legal challenge or is held to be invalid, unenforceable or illegal in any respect, the validity, legality and enforceability of this lease will not in any way be affected or impaired

thereby and lessee will retain, in accordance with the terms of this lease, the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits, upon, or under the lands described in this lease, including the right to vent or discharge coal mine methane for safety purposed as required by applicable laws and regulation.

2.2 Alternatives Considered but Eliminated from Detailed Analysis:

The BLM is required to analyze all reasonable alternatives necessary in order to permit a reasoned choice (40 CFR 1502.14). If the BLM considers alternatives during the environmental analysis process, but decides not to analyze them in detail, the alternatives must still be identified, along with a brief explanation as to why they were eliminated from further analysis (40 CFR 1502.14). An alternative may be eliminated from detailed analysis if:

- it would not fulfill requirements of the FLPMA, or other applicable laws, rules, regulations, policies, standards, or guidelines;
- it would not meet the Purpose and Need for the Proposed Action;
- it is technically or economically infeasible (considering whether implementation of the alternative is likely, given past and current practice and technology)
- it is remote or speculative to implement;
- it is inconsistent with the basic policy objectives for the management of the area [that is, it is not in conformance with the Project Area Resource Management Plan (RMP)];
- it is substantially similar in design to an alternative that is analyzed; and/or
- it would result in substantially similar impacts to an alternative that is analyzed (BLM 2008).

Alternatives that were considered, but eliminated from detailed analysis, are discussed below.

Approve One Lease Modification Request and Reject the other Modification

An alternative to approve only one of the two lease modifications requested, while rejecting the other lease modification requested, was considered but eliminated from further analysis. The BLM may modify the lease in order to include all or part of the lands applied for *if* it is determined that:

- the modification serves the interests of the United States;
- there is no competitive interest in the lands or deposits; and

- the additional lands or deposits cannot be developed as part of another potential or existing independent operation [43 CFR 3432.2(a)].

The BLM reviewed the lease applications and determined that *both modifications* meet the above-mentioned requirements. In addition, in accordance with the requirements of the MLA, the MLAAL, the FCLAA, the FLMPA, the Energy Policy Act of 2005, 43 CFR 3400, and all other applicable laws, rules, regulations, standards, policies, and guidelines, the BLM is required to facilitate the recovery of known Federal coal reserves; to make Federal coal reserves accessible for development; and to foster and encourage the orderly development of domestic coal reserves. The purpose and need for the BLM, in relation to the Proposed Action and the resulting preparation of this EA, is to respond to the coal lease modifications application as required by law, and to: approve the modifications, as proposed, in order to prevent the bypassing of approximately 10.1 million recoverable tons of Federal coal (considered under the Proposed Action); to approve the modifications, with design features, in order to prevent the bypassing of approximately 10.1 million recoverable tons of Federal coal (considered under the Proposed Action Alternative); or to deny the proposed modifications (considered under The No Action Alternative). The coal lease modification tracts would allow a more efficient mine layout that improves access to more coal reserves in the parent lease area thus preventing bypass of coal reserves within an existing lease. Approving one lease and not the other would not fulfill requirements of the FLPMA, or other applicable laws, rules, regulations, policies, standards, or guidelines; and it would not meet the purpose and need for the Proposed Action.

2.3 Coal Lease Modification Regulations

In accordance with 43 CFR 3432.1(a), a lessee may apply for a modification of a lease in order to include coal lands or coal deposits contiguous to those embraced in a lease. Originally, CFR 3432.1(a) stated that “In no event shall the acreage in the application, when combined with the total area added by all modifications made after August 4, 1976, exceed 160 acres or the number of acres in the original lease, whichever is less.” However, the Energy Policy Act of 2005 (EPA) (42 USC 16501) increased the limitation for lease modifications from 160 acres to 960 acres.

MCC has filed the application for the modifications in the BLM Colorado State Office having jurisdiction over the mineral estate in the lands involved. The application has described:

- the additional lands desired;
- the lessee's needs or reasons for such modification; and
- the reasons why the modification would be to the advantage of the United States [43 CFR 3432.1(b)].

The BLM has determined that:

- the modification serves the interests of the United States;
- there is no competitive interest in the lands or deposits; and
- the additional lands or deposits cannot be developed as part of another potential or existing independent operation [43 CFR 3432.2(a)].

Upon a decision by BLM to issue the lease modifications, the lands applied for shall be added to the existing leases without competitive bidding; however, the United States shall receive the

Fair Market Value of the leases of the added lands, either by cash payment or adjustment of the royalty applicable to the lands added to the leases by the modification [43 CFR 3432.2(c)].

The terms and conditions of the original leases shall be made consistent with the laws, regulations, and each of the leases terms applicable at the time of modification. Before the leases are modified, the lessee shall file a written acceptance of the conditions imposed in the modified leases and a written consent of the surety under the bond covering the original leases to the modification of the leases and to extension of the bond to cover the additional land [43 CFR 3432.2(b)]. Before modifying a lease, the BLM is required to prepare an EA or an EIS covering the proposed lease area in accordance with 40 CFR parts 1500 through 1508 [43 CFR 3432.2(c)].

The entire surface for the coal lease modifications application involves the USFS as the SMA. Therefore, in compliance with the coal leasing regulations found at 43 CFR 3432.2(d), the BLM has submitted the lease modifications application to the Secretary of Agriculture for consent, for completion or consideration of an EA, for the attachment of appropriate lease stipulations, and for making any other findings prerequisite to lease issuance.

Chapter 3 - Affected Environment, Environmental Consequences, and Mitigation Measures

Introduction

Affected Environment

This section describes the existing condition of the biological, physical, and socioeconomic characteristics found within the Project Area, including human uses, that could be affected (impacted) by the implementation of the proposed alternatives. During an environmental analysis, a description of the present condition of the affected public lands, and their associated resources, provides a basis for identifying and interpreting potential impacts of the alternatives proposed in this EA.

Resources

BLM

In accordance with the requirements of the MLA, the MLAAL, the FCLAA, the FLMPA, 43 CFR 3432, and all other applicable laws, rules, regulations, standards, policies, and guidelines, the BLM will decide whether or not to modify existing Federal coal leases at the West Elk Mine by adding approximately 800 acres to coal lease COC-1362 and approximately 921 acres to coal lease COC-67232.

Specifically, the BLM is analyzing the following alternatives:

- No Action Alternative, the BLM would deny the request (the Proposed Action) for the coal lease modifications;

- Proposed Action, the BLM would approve the Proposed Action exactly as proposed by the Proponent; or

- Proposed Action Alternative, the BLM would approve the alternative with design features (in the form mitigation measures and pursuant to the Lease Addendums).

This section describes the biological and physical resources found within the Project Area under the jurisdiction of the BLM that may be impacted as the result of the implementation of the Proposed Action Alternative (the leasing decision). These resources include Air Quality and Atmospheric Values; and Socioeconomics.

USFS

When the surface estate of these lands is managed by another agency, such as the USFS, the BLM is responsible for conducting the environmental impacts analysis for the resources that may be impacted by the implementation of the leasing decision (in this case those associated with air quality and atmospheric values and socioeconomics). The SMA, the USFS in this case, is responsible for conducting the environmental impacts analysis for the affected surface environment (including in relation to such resources as vegetation, wildlife, wetlands and riparian areas, and cultural resources; and to such resources uses as recreation and travel management). The SMA is also responsible for providing "consent" for the BLM's leasing decision.

The USFS, as the responsible SMA, is responsible for the environmental analysis for such surface resources as:

- Topographic and Physiographic Environment;
- Geology;
- Soils;
- Watershed;
- Vegetation;
- Threatened and Endangered Species;
- Sensitive Species;
- Sensitive Plants;
- Management Indicator Species;
- Migratory Birds;
- Range Resources;
- Recreation;
- Transportation System and Roadless;
- Heritage Resources; and
- Visual Resources.

Therefore, this document does not analyze these resources. The BLM will not authorize a lease modification until it receives consent from the USFS.

Table 3.0 Environmental Assessment Resource Areas

Resource/Issue	N/A or Not Present	Applicable or Present, No Impact	Applicable & Present and Brought Forward for Analysis	Rationale for No Impact
Air Resources			X	
Areas of Critical Environmental Concern	X			
Environmental Justice			X	
Cultural Resources	X			
Flood Plains	X			
Fluid Minerals	X			
Forest Management	X			
Hydrology/Ground	X			
Hydrology/Surface	X			
Invasive/Non-Native Species	X			
Lands with Wilderness Characteristics	X			
Native American Religious Concerns	X			
Migratory Birds	X			
Paleontology	X			
Prime and Unique Farmland	X			
Range Management	X			
Realty Authorizations	X			
Recreation/Transportation	X			
Socioeconomics			X	
Soils	X			
Solid Minerals	X			
T&E and Sensitive Animals	X			
T&E and Sensitive Plants	X			
Upland Vegetation	X			
Visual Resources	X			
Wastes, Hazardous or Solid	X			
Water Quality - Surface	X			
Wetlands/Riparian Zones	X			
Wild and Scenic Rivers	X			
Wild Horse & Burro Mgmt	X			
Wilderness Study Areas	X			
Wildlife – Aquatic	X			
Wildlife – Terrestrial	X			

Environmental Consequences

This section describes, and compares, the environmental consequences (impacts) that may result from the implementation of the three proposed alternatives. This section analyses the alternative management actions, and discloses the potential impacts of the proposed alternatives on the human and natural environment. The human environment is considered to include both the natural environment (resources) and the BLM multiple-use and sustained-yield land management environment (resource uses) within the jurisdiction of the agency in relation to the Proposed Action.

Impact Analysis Methods and Assumptions

Analysis of Alternatives

The analysis of alternatives describes how the implementation of each alternative could affect baseline conditions of individual resources within the Project Area.

Impact Analysis

When applicable, definitions of the following types of impacts are included in the evaluation of potential environmental impacts (all possible impacts are not described and, unless otherwise stated, impacts described in this section are assumed to be adverse). Comparison of impacts is intended to provide an impartial assessment to help inform the decision-maker and the public. The impact analysis does not imply or assign a value or numerical ranking to impacts. Actions resulting in adverse impacts to one resource may impart a beneficial impact to other resources. In general, adverse impacts described in this section are considered important if they result from, or relate to, the implementation of any of the alternatives. These impacts are defined as follows:

- **Direct Impacts --** Direct impacts are impacts that are caused by the action, and that occur at the same time and in the same general location as the action.

- **Indirect Impacts --** Indirect impacts often occur at some distance, or time, from the action.

- **Short- or Long-term Impacts --** When applicable, the short-term or long-term aspects of impacts are described. For purposes of this EA, short-term impacts occur during or after the activity or action, and may continue for up to 2 years. Long-term impacts occur beyond the first 2 years.

- **Cumulative Impacts --** Cumulative impacts are impacts that result from the incremental impact of the action when it is added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor; however, collectively significant, actions taking place over a period of time. For the purposes of this EA, potential cumulative impacts include those that could occur on other Federal and non-Federal lands.

3.1 Air Quality and Atmospheric Values

This section discloses the affected environment and environmental consequences to air quality that would result from implementing the different alternatives under consideration. The discussion below details laws and regulations related to air quality, the current status of air resources in the area, and potential impacts to air quality that may result from extending the lifetime of the West Elk Mine if the lease modifications occur. This section was produced by BLM and Forest Service Specialists with Environmental Protection Agency (EPA) review.

3.1.1 *Affected Environment*

Legal Framework

The Clean Air Act, passed in 1970 and amended in 1977 and 1990, requires the EPA to set standards for air pollutants to protect the public health and welfare. The standards, known as National Ambient Air Quality Standards, limit the amount of these pollutants that can be present in the atmosphere. The EPA has set standards for six common pollutants known as "criteria" air pollutants—ozone (O_3), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and carbon monoxide (CO). There are standards for two categories of particulate matter—one for suspended particles less than 10 micrometers in diameter (PM_{10}) and one for fine particles less than 2.5 micrometers in diameter ($PM_{2.5}$). Primary standards are designed to protect public health, while secondary standards are designed to protect public welfare. These standards are shown in Table 3.1a. Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu g/m^3$).

Table 3.1a. National Ambient Air Quality Standards

Pollutant [final rule cite]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide [76 FR 54294, Aug 31, 2011]		primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead [73 FR 66964, Nov 12, 2008]		primary and secondary	Rolling 3 month average	0.15 $\mu g/m^3$ (1)	Not to be exceeded
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]		primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		primary and secondary	Annual	53 ppb (2)	Annual Mean
Ozone [73 FR 16436, Mar 27, 2008]		primary and secondary	8-hour	0.075 ppm (3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution [71 FR 61144, Oct 17, 2006]	$PM_{2.5}$	primary and secondary	Annual	15 $\mu g/m^3$	annual mean, averaged over 3 years
			24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sept 14, 1973]		primary	1-hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
(2) The official level of the annual NO2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
(3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.
(4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved

Unlike most other criteria pollutants, ozone is not emitted to the atmosphere directly; it is formed when nitrogen oxides and volatile organic compounds react in the presence of sunlight. In general, ozone concentrations in the lower atmosphere are highest during warmer months and lower in the cooler months. In some parts of the western U.S., high winter-time ozone concentrations have been monitored. The project area is not in an airshed with monitored high winter-time ozone concentrations. The chemical reactions that form ozone are complicated and nonlinear, making it difficult to predict ozone concentrations that will result from increasing the amount of the ozone precursors (i.e., nitrogen oxides and volatile organic compounds) in the atmosphere. The effect of adding nitrogen oxides or volatile organic compounds to the atmosphere on the concentration of ozone depends upon the ratio of the two precursors already present. Ozone formation is also highly dependent on meteorological conditions, including temperature, wind speed, and solar radiation. Ozone in the lower atmosphere is harmful to human health and vegetation. Some fine particulates ($PM_{2.5}$), particularly ammonium sulfate and ammonium nitrate particles, can also be formed in the atmosphere from the interaction of either SO_2 or nitrogen oxides and ammonium. These types of $PM_{2.5}$ particles are referred to as secondary particulates, while particles emitted directly from a source are referred to as primary particulates.

Fine particulate matter ($PM_{2.5}$) is chiefly comprised of five mass types: organic mass, elemental carbon (also known as soot or black carbon), ammonium sulfates, ammonium nitrates, and crustal materials (i.e., soil). Primary fine particulate emissions result from combustion processes (including fossil fuel combustion and biomass combustion that occurs in wild fires) and include black carbon. In general, however, black carbon and crustal materials comprise a relatively small proportion of the fine particulate mass suspended in the atmosphere. The largest constituents of fine particulate are usually organic mass, ammonium nitrates, and ammonium sulfates. Secondary particulates do not result from emissions of fugitive dust (which is the largest emissions category from the West Elk Mine), and thus will not be discussed further in this document.

The Clean Air Act contains provisions for protection of air quality in areas that are meeting the ambient air quality standards. This is known as the prevention of significant deterioration (PSD) program. Under this program, areas of the country are designated as Class I, Class II, or Class III. Class I areas are defined as areas of special national or regional natural, recreational, or historic value. The Act established mandatory federal Class I areas including wilderness areas over 5,000 acres in size and national parks over 6,000 acres in size that were in existence in 1977. These areas receive special protection under the Act. All other areas of the country have been designated as Class II. An area's classification determines the maximum amount of additional air pollution, called an increment that can be added beyond a baseline value. Increment consumption analysis falls under the PSD major sources permitting

program, which is administrated by the Colorado Air Pollution Control Division. Only small amounts of pollution can be added in Class I areas, while Class II areas permit moderate amounts of pollution to be added. Larger amounts of pollution can be added to Class III areas, but there are as yet no areas in the country designated Class III.

In Colorado, authority to issue construction permits that allow sources to emit air pollutants has been delegated by the Environmental Protection Agency to the state. Stationary sources are classified as major or minor, depending on the amount of pollutants emitted. In general, a construction permit is required for a facility with uncontrolled actual emissions of any criteria pollutant equal to or greater than the amounts listed in Table 3.1b:

Table 3.1b. Colorado Minor Source Permitting Limits for Attainment Areas

Criteria Pollutant	Attainment Area uncontrolled actual emissions in tons per year
volatile organic compounds	5
PM_{10}	5
Total Suspended Particulates	10
Carbon Monoxide	10
Sulfur Dioxide	10
Nitrogen Oxides	10
Lead	200 pounds per year
*other Criteria Pollutants	2

* Other criteria pollutants include: fluorides, sulfuric acid mist, hydrogen sulfide, total reduced sulfur, reduced sulfur compounds, and municipal waste combustor emissions. (Source: http://www.cdphe.state.co.us/ap/conperm.html#New or Modified)

In addition, the state can issue ambient air quality standards that are at least as stringent as the national standards. The state tracks the PSD increments in its Class I and Class II areas as part of its permitting program and is responsible for ensuring that the increments are not exceeded.

The Clean Air Act amendments of 1977 set a national goal of preventing future and remedying any existing impairment to visibility in Class I areas that is caused by man-made pollution. The EPA promulgated the Regional Haze Rule in order to meet this goal. Visibility is a measure of not only how far one can see, but how well one can see important characteristics of the landscape such as form, color, geologic features, and texture. Visibility impairment is caused by the scattering of light by gases and particles in the atmosphere. Man-made pollution results in the addition of very small particles to the atmosphere, resulting in haze. A monitoring network was established by the Interagency Monitoring of Protected Visual Environments (IMPROVE) program to measure atmospheric particulate concentrations near Class I areas. The Regional Haze Rule requires states to develop and implement plans to improve visibility in Class I areas in order to achieve “natural” visibility levels within a 60-year period.

Air pollutants that may cause cancer or other harmful effects such as birth defects are classified as hazardous air pollutants (HAPS). EPA is required to control emissions of 187 such hazardous air pollutants. Examples of hazardous air pollutants include benzene, which is found in gasoline; perchlorethlyene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper by a number of industries (http://www.epa.gov/ttn/atw/pollsour.html). EPA has issued rules requiring that facilities

belonging to 96 different classes meeting emissions standards for hazardous air pollutants in order to reduce these emissions. Hazardous air pollution emissions standards can be found on the EPA's web site (http://www.epa.gov/ttn/atw/mactfnlalph.html) as well as information on progress that has been made on reducing toxic emissions (http://www.epa.gov/ttn/atw/allabout.html#progress).

Physical Environment

The West Elk Mine is located in Section 16, Township 13 South, Range 90 West, one mile east of Somerset on State Highway 133, in Gunnison County, Colorado. The mine has been operating for 29 years and holds about 14,395 acres of federal coal leases and 3656 acres of fee coal lands. Surface facilities include office, warehouse, shop, and coal handling facilities, and are located about 6 miles north of the proposed modifications. These existing facilities would also be used for mining the proposed lease modification areas.

Somerset Colorado is located in the North Fork Gunnison River Valley and rests at approximately 6,040 feet above sea level. The area is rural, has mountainous terrain, and supports a population of approximately 526 residents (2010 US Census). The normal temperatures (minimum and maximum) for the area range from 14.7 to 38.5 ˚F in January to 56.7 to 90.1 ˚F in July. The average annual precipitation amounts to approximately 15.07 inches, which according to historical records is relatively evenly distributed throughout the year. Average annual wind resultants are generally from the southeast at a speed of approximately 7.1 mph. The area enjoys sunshine for approximately 70% of the time and has an annual average sky cover of around 52%.

Air quality in the area is generally good. Areas that meet federal ambient air quality standards are classified as being in attainment, while areas not meeting standards are classified as being in nonattainment. Currently there is only one nonattainment area in Colorado for ozone that includes part or all of Denver, Adams, Arapahoe, Boulder, Broomfield, Douglas, Jefferson, Larimer, and Weld counties (roughly the Denver-Boulder-Greeley-Fort Collins metropolitan areas). This area is located along the Front Range approximately 110 miles to the east of the West Elk Mine. The Denver nonattainment area was designated by EPA in 2007 and is based upon the 1997 ozone standard. The ozone standard was revised in 2008, but EPA has not issued new nonattainment designations based upon that standard as of April 2012. EPA has not identified any current nonattainment areas in Colorado for any of the other criteria pollutants.

Colorado maintains a network of monitors that track compliance with ambient air quality standards. Most of the monitors are located in the eastern half of the state, particularly along the more urban Front Range. Western Colorado, by comparison, is relatively sparsely populated, and there are no monitors in the immediate vicinity of the West Elk Mine. There are, however, monitors in some areas of western Colorado, particularly Grand Junction. Table 3.1c shows the maximum monitored values by county for selected locations in the western portion of the state for 2009-2011. Not every county has monitoring, and counties that do have monitors do not necessarily have monitoring for all criteria pollutants. While these monitors cannot provide information regarding air quality in the immediate vicinity of the mine, they do provide insight into regional air quality conditions. There are no SO_2 monitors located in the selected counties. The table indicates exceedances of the $PM_{2.5}$ 24-hour standard in Mesa County for 2009 and 2010, but the 3-year average value ending in 2011 indicates that the 24-hour standard was met. The Mesa County monitor is located in Grand Junction, approximately 61 miles from the West Elk Mine. One ozone exceedance occurred in 2011 in La Plata County

at a monitor located roughly 110 miles from the West Elk mine. No other exceedances of ambient air quality standards are noted in the table. An exceedance occurs whenever an individual measurement is recorded that is above the level of the standard, but as the standards are generally defined as an average of several values, an individual exceedance does not necessarily indicate a violation of an ambient air quality standard. None of the listed monitors indicates a violation of any ambient air quality standard.

Table 3.1c. Air Pollutant Monitoring Results for Selected Counties in Western Colorado.

County	CO 2nd Max 1-hr (ppm)	CO 2nd Max 8-hr (ppm)	NO_2 98th Percentile 1-hr (ppb)	Ozone 2nd Max 1-hr (ppm)	Ozone 4th Max 8-hr (ppm)	$PM_{2.5}$ 98th Percentile 24-hr ($\mu g/m^3$)	$PM_{2.5}$ Weighted Mean 24-hr ($\mu g/m^3$)	PM_{10} 2nd Max 24-hr ($\mu g/m^3$)	PM_{10} Mean 24-hr ($\mu g/m^3$)
2009									
Delta								58	25
Garfield				0.07	0.062			71	25
Gunnison								86	27
La Plata	1.4	0.9	47	0.08	0.071	12	4.4	40	20
Mesa	2.3	2.2		0.07	0.064	41	9.6	122	31
Montezuma				0.08	0.069	15	6.8		
San Miguel								72	18
2010									
Delta								115	23
Garfield				0.07	0.066			55	26
Gunnison								92	24
La Plata	1.2	0.7	39	0.08	0.074	11	4.3	88	21
Mesa	1.7	1.1		0.08	0.068	37	9	131	28
Montezuma				0.08	0.066	13	6	.	.
San Miguel								52	15
2011									
Delta								48	21
Garfield				0.07	0.066			73	21
Gunnison				0.07	0.064			74	24
La Plata	1.3	0.7	38	0.08	0.077	12	4.5	50	18
Mesa	1.8	1.1		0.08	0.068	22	7.1	54	25
Montezuma				0.08	0.071	15	6.1		
San Miguel								61	16

Source: http://www.epa.gov/airdata/ad_rep_con.html

In addition to the state monitors, the EPA maintains a network of rural monitors known as the Clean Air Status and Trends Network (CASTNET). The closest CASTNET monitor is located in Gothic, Colorado, near the West Elk Wilderness approximately 25 miles east of the West Elk Mine. This is the closest ozone monitor to the mine and it has collected ozone data since 1989. The latest available 3-year average of the annual 4th-highest 8-hour ozone concentration (through 2010) was 67 ppb, and the highest value of this statistic since 1991 (the first year it was possible to calculate a 3-year average) was 71 ppb, indicating compliance with the ozone ambient air quality standard.

The closest Class I areas to the mine are the Black Canyon of the Gunnison National Park, roughly 24 miles away, and the West Elk Wilderness, which is about 6 miles from the mine. The State of Colorado prepared a state implementation plan for visibility as required under the EPA's Regional Haze Rule that documents the steps the state will take in order to meet the national goal of achieving natural visibility conditions in its Class I areas by 2064. The state examined the West Elk Mine's emissions due to its proximity to the West Elk Wilderness and concluded that it would not have a significant impact on visibility in the wilderness. For this reason the state determined that, in this planning period, it would not be necessary to require additional emissions controls on the mine to meet the visibility goals for the wilderness. (*Colorado Visibility and Regional Haze State Implementation Plan for the Twelve Mandatory Class I Federal Areas in Colorado*, Colorado Air Pollution Control Division, January 7, 2011, http://www.cdphe.state.co.us/ap/regionalhaze.html.)

The plan also included the results of detailed modeling analyses that examined the impacts of regional emissions sources, including those in Colorado, to visibility in all Class I areas in the state. The state developed emissions inventories that examined current emissions (as of 2002) as well as projected emissions through 2018 to evaluate the progress that would be made by 2018 toward the visibility goal. The inventories used in the modeling analysis included the emissions from the West Elk Mine at its permitted rate (as of 2002)[1] and projected using economic growth analyses. The plan was accompanied by individual technical support documents that examined impacts to each of the Class I areas in detail, including the West Elk Wilderness and Black Canyon of the Gunnison. The state will re-examine visibility progress in five year intervals and determine whether additional steps are needed to meet visibility progress goals. Because the annual coal processing rate under any alternative will not exceed the rates analyzed in Colorado's study, no additional visibility analysis was conducted for this EIS.

Air pollutants can be deposited through precipitation (such as rain or snow) or by dry settling processes to surfaces on the ground such as soils and water bodies. Deposition of some types of pollutants, particularly nitrogen and sulfur compounds (e.g., nitrate and sulfate), can lead to acidification of lakes and streams. Acidification of surface waters can negatively affect aquatic organisms such as zooplankton, algae, diatoms, invertebrates, amphibians, and fish. Nitrogen can cause other ecosystem impacts by fertilizing both soils and water. These excess inputs of nitrogen can disrupt the natural flora and fauna by allowing certain species that would not naturally occur in abundance to out-compete those that thrive in pristine nitrogen-limited systems. The end result is an unnatural shift in species composition for sensitive species, which may have a subsequent impact on other components of the ecosystem.

The chemistry of wet precipitation (rain and snow) is monitored by the National Atmospheric Deposition Program (NADP), an interagency organization that maintains a network of samplers located across the country. The nearest NADP monitor to the West Elk Mine is located near Gothic, approximately 25 miles to the east of the mine. Figures 1 and 2 show trend plots of nitrate and sulfate concentrations in wet deposition as measured by the Gothic NADP wet deposition monitor. As indicated on the plots, some years (2006, 2008, 2009, 2010) did not meet the NADP program's completeness criteria, but the trends suggest that concentrations of nitrate and sulfate have decreased somewhat since monitoring began in 1999. Figure 3 shows trends in inorganic wet nitrogen (N) deposition (where the amount of nitrogen is the sum of

[1] The mine's 2002 permitted emissions rate was at least as high as the current permitted rate (as stated in its 2010 construction permit).

nitrogen from nitrate and ammonium in wet deposition). It is important to note that measured wet deposition (as opposed to the concentration of a substance in precipitation) is influenced by the amount of precipitation that occurs, and thus the trend in nitrogen deposition may not reflect trends in the amount of a substance that is present in the atmosphere. However, the plot does show that for years with complete data the deposition of nitrogen at Gothic varied from approximately 1 to 1.5 kilograms per hectare. The National Park Service has set a critical load for nitrogen deposition for Rocky Mountain National Park, located in the Front Range northwest of Denver, of 1.5 kilograms per hectare per year (http://www.nature.nps.gov/air/Studies/criticalloads/criticalLoadExplain.cfm). A critical load is a level of deposition below which significant harmful ecosystem effects are not known to occur. As the mountainous terrain and sensitive alpine areas found near Gothic (such as the West Elk Wilderness) are similar to those found in Rocky Mountain, this suggests that present levels of nitrogen deposition are not likely to be a problem in the area. No critical load for sulfur deposition has been established by a federal land manager in Colorado.

Figure 3.1a. Annual trends in nitrate (NO3) concentrations in wet deposition collected by the Gothic, Colorado (CO10) National Atmospheric Deposition Program monitor.

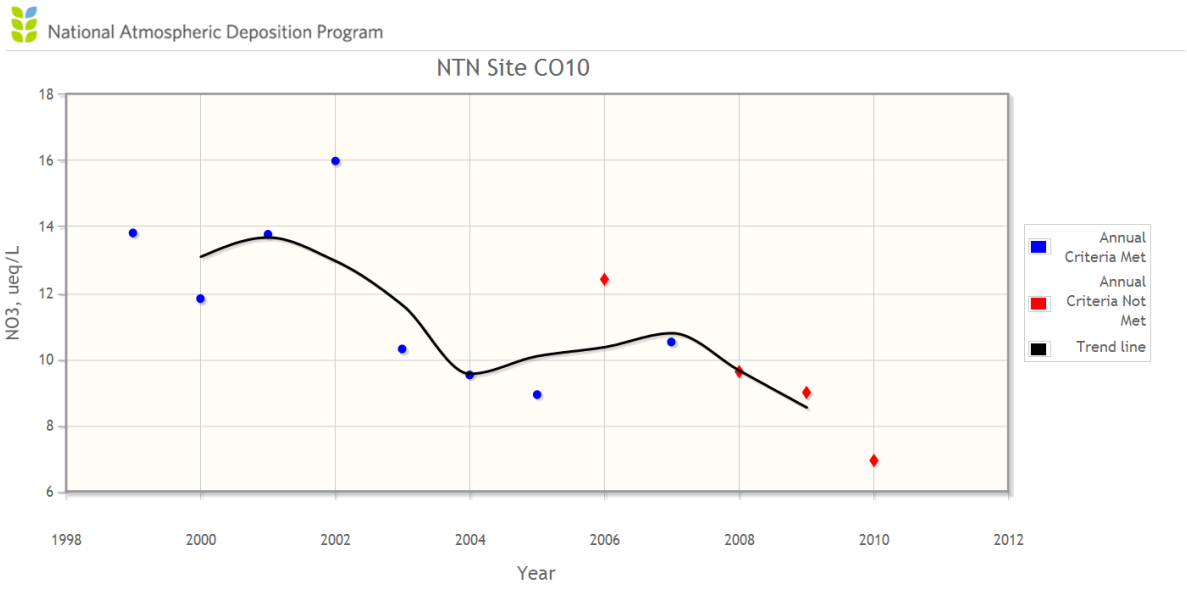


Figure 3.1b. Annual trends in sulfate (SO_4) concentrations in wet deposition collected by the Gothic, Colorado (CO10) National Atmospheric Deposition Program monitor.

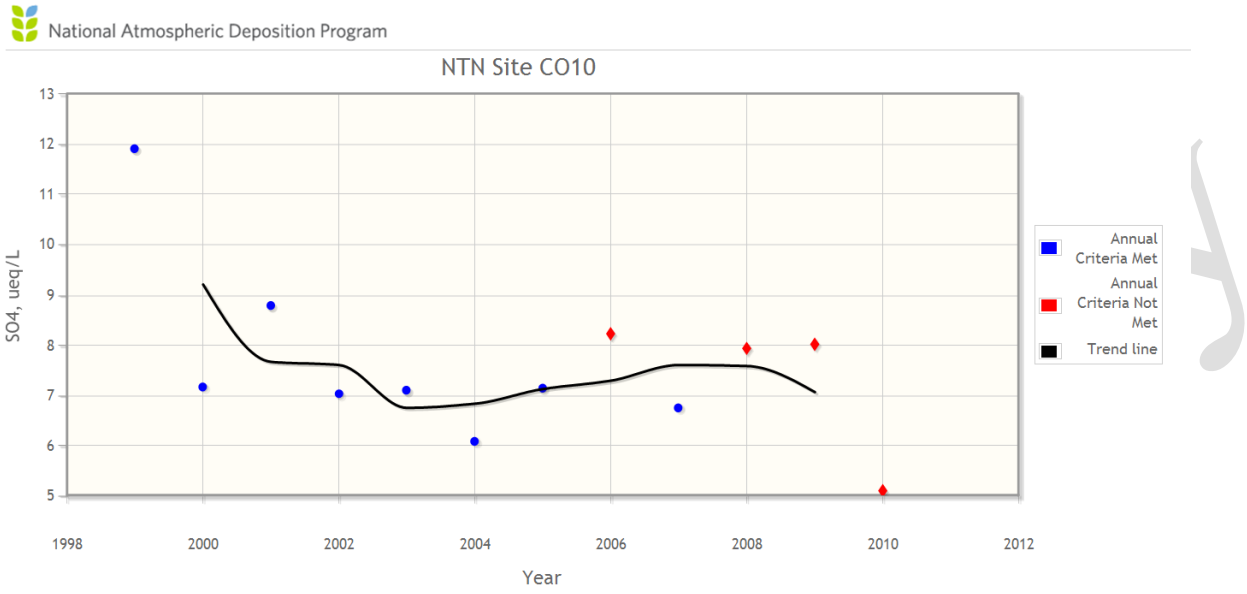
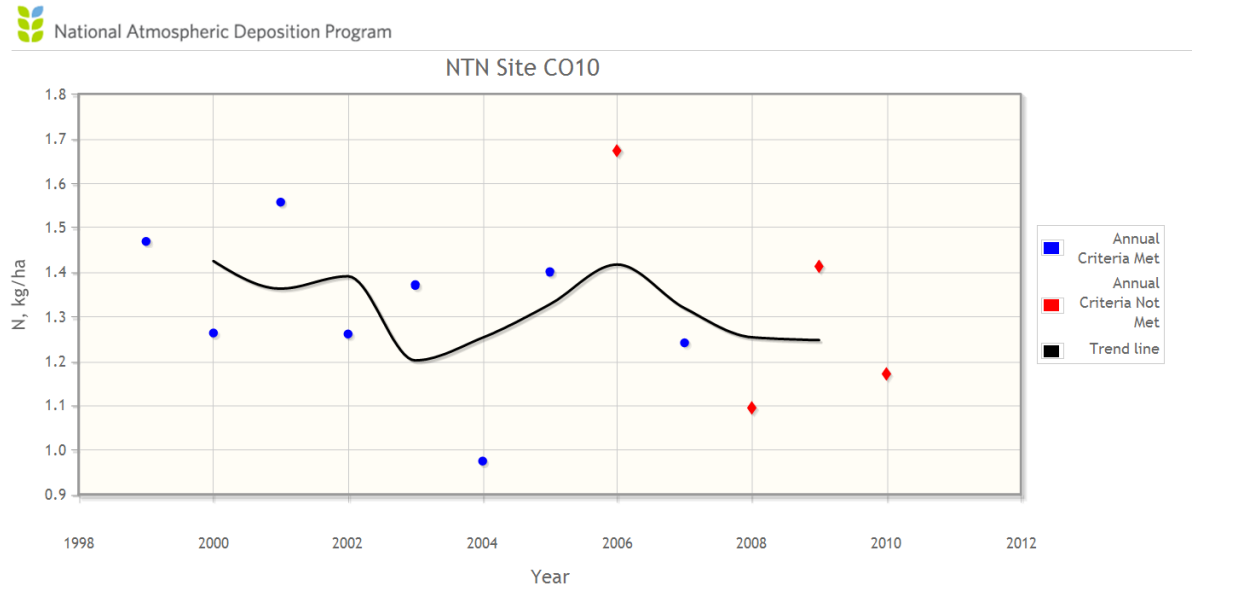


Figure 3.1c. Annual trends in nitrogen (N) wet deposition as measured by the Gothic, Colorado (CO10) National Atmospheric Deposition Program monitor.



Plot notes (applicable to Figures 1-3):
The annual weighted mean concentrations and depositions are characterized as meeting or not meeting the NADP's data completeness criteria for the 1-year period.
1.Valid samples for 75% of the time period
2.Valid samples for 90% of the precipitation amount
3. Precipitation amounts for 75 % of the time period
Trend line
The trend line is a smoothed 3-year moving average with a one-year time step. The line is only displayed where the minimum data completeness criteria is met for the 3-year period.
Source: http://nadp.sws.uiuc.edu/sites/siteinfo.asp?net=NTN&id=CO10

Emissions of air pollutants in the region surrounding the mine result from industrial sources, smoke from prescribed and wildfire, mobile sources such as trains and vehicles, off-road vehicles, wind-blown dust from areas

of exposed soil such as fields and unpaved roads, road construction, and other activities. State emissions data for Gunnison and Delta counties for 2008 are given in Table 3.1d below.

Table 3.1d. 2008 Emissions Inventory by Source Category for Gunnison and Delta Counties, Colorado, in tons.

Source	*Delta County*						*Gunnison County*					
	Benzene	**CO**	**NO2**	**PM10**	**SO2**	**VOC**	**Benzene**	**CO**	**NO2**	**PM10**	**SO2**	**VOC**
Agricultural Tilling				270.88						0.79		
Aircraft	0.65	288.03	1.56	5.67	0.24	27.07	0.22	121.58	4.17	2.33	0.48	9.39
Biogenic		2040.81	232.53			16546.90		2681.08	192.99			20474.30
Combustion	0.00	231.14	47.37	5.12	15.18	9.91	0.00	29.73	19.55	0.62	1.82	1.81
Construction				367.98						400.97		
Forest and Agricultural Fires	4.62	1051.06	34.90	130.29	7.88	61.39	16.42	3389.85	89.51	469.02	28.64	218.40
Non Road	7.22	1206.47	248.62	27.57	0.77	270.94	16.57	2097.71	275.42	39.32	0.84	664.81
Oil Gas Area		4.97	0.11	0.00		0.57		23.23	20.36	2.21	0.44	54.92
Oil Gas Point							2.81	131.56	147.24	0.97	0.07	84.79
Pesticides						27.52						13.48
Point Source	0.13	0.86	6.09	378.17	0.19	17.27	1.10	38.06	36.05	215.46	0.92	60.71
Portables	0.03					10.49	0.05					15.03
Railroad	0.02	22.14	224.75	5.58	12.80	8.37	0.01	8.22	83.43	2.07	4.75	3.11
Refueling	0.15					14.55	0.11					10.77
Restaurants	0.13	2.94	0.02	7.93	0.02	7.33	0.06	1.44	0.01	3.88	0.01	3.59
Road Dust				961.00						1229.75		
Solvents						116.38						57.25
Structure Fires		1.91	0.04	0.34		0.35		0.93	0.02	0.17		0.17
Surface Coating						89.46						52.22
Tank Trucks	0.00					0.33	0.00					0.29
Vehicles	14.53	5027.39	745.32	30.95	5.80	461.62	11.49	3830.83	537.35	21.50	3.95	365.69
Wood burning	18.52	2254.55	30.50	312.36	4.73	435.96	9.17	1115.69	15.09	154.58	2.34	215.74
Total	**46.00**	**12,132.27**	**1,571.84**	**2,503.85**	**47.61**	**18,106.41**	**58.01**	**13,469.91**	**1,421.20**	**2,543.65**	**44.28**	**22,306.46**

(Source: http://www.colorado.gov/airquality/inv_maps_2008.aspx)

3.1.2 No Action Alternative Environmental Effects

It is anticipated that mining operations will continue on existing leases even if the two leases modifications under consideration in this analysis are not granted under the proposed action. The mine life is currently projected for an additional 11-12 years on existing federal coal reserves, with perhaps as much as an additional 2 years on non-federal minerals (fee reserves). The mine currently employs longwall equipment and methods for extracting the underground coal. This practice would continue under the modified leases. Additionally, other activities currently authorized at the site including coal processing and venting of gases would also continue in accordance with the permits and site operations plans that are currently active. The proposed lease modification thus represents a continuation of the existing activity occurring at the mine location, and will not increase the intensity of operations above currently evaluated levels (there is no proposed change in the rate of coal extraction under any alternative). It is therefore possible to infer impacts to air quality due to future mining operations from current conditions.

For purposes of this discussion, emission sources at the West Elk Mine are grouped into three general categories:

1. stationary sources;
2. mobile sources located below ground and above ground at the mine complex; and
3. MDW-related emissions: mobile source, construction, methane, and fugitive dust emissions that result from drilling, operating, and servicing methane drainage wells, constructing well pads, and construction of roads used to access the drainage wells.

These emission sources are discussed below.

Most emissions of criteria pollutants resulting from stationary sources at the mine are in the form of particulate matter. Sources of particulate matter at the mine include various coal handling equipment such as conveyors and transfers, coal storage silos and feeders, coal storage and refuse piles, coal mine ventilation shafts, a coal preparation plant, an emergency generator, miscellaneous exempt [2] sources such as heating equipment, auxiliary generators, and fuel storage tanks, and coal hauling operations. The mine has a permit for PM_{10} emissions issued by the state in 2010 (Construction Permit 09GU1382, issued June 18, 2010). This permit limits the emissions of particulate matter by limiting the total amount of coal that can be processed in a year to 8.5 million tons of coal per year. The permit also limits the sizes of different coal stockpiles that are allowed, the hours of operation of various maintenance activities, the total quantity of refuse material from the coal preparation plant and the and the amount of coal that can be processed by the coal preparation plant. The permit limits the total PM_{10} emissions for the mine's stationary sources to 88.2 tons per year. This classifies the mine as a minor source for particulate matter, as the threshold for major sources is 250 tons per year. The permit also contains a requirement for the operator to follow a fugitive dust control plan that is attached to the permit. The plan applies to coal handling equipment such as conveyors, coal processing equipment, storage silos, storage piles, hauling activities, mine ventilation shafts, and coal preparation plant processing equipment. In addition to the requirements in the construction permit, the Colorado Division of Reclamation, Mining, and Safety (CDRMS) Mining and Reclamation plan includes general air pollution control requirements. These include applying water to any active unpaved roadways, parking areas, and refuse disposal area to control dust emissions from these areas, if required, on a seasonal basis, and compacting and spraying of coal stockpiles when necessary to eliminate particulate emissions created during coal handling. In addition to regular watering (sprinkling) of the regularly travelled gravel roads on the mine site, these roads are treated at least once a year with magnesium chloride for dust suppression.

At the time the permit request was submitted, the state did not require reporting for $PM_{2.5}$ in accordance with the EPA's surrogate policy. This policy allowed states to use PM_{10} emissions as a surrogate for $PM_{2.5}$ due to technical difficulties that existed in analyzing $PM_{2.5}$ emissions (http://www.epa.gov/NSR/documents/20100204repealfs.pdf). As a result, the permit does not contain emissions limits for $PM_{2.5}$. There are no emissions from stationary sources at the mine of other criteria pollutants above minor source permitting thresholds and therefore the permit does not contain limits for criteria pollutants other than particulate matter.

The application for the 2010 permit was accompanied by a dispersion modeling analysis (*PM-10 Dispersion Modeling Study, Coal Prep Plant Modification, West Elk Mine: Gunnison County, Colorado*, prepared by Air

[2] Certain types of sources are specifically exempted from permitting by the State of Colorado under Regulation 3 (http://www.cdphe.state.co.us/ap/conperm.html).

Resource Specialists, Inc., February 25, 2010). This analysis was completed to support the mine's permit modification request, which included a proposal to build the coal preparation plant mentioned above. The analysis examined the potential particulate matter emissions that would occur from the new facility, as well as other facilities at the mine. The dispersion modeling analysis also included sources from the nearby Oxbow Mine, and included a background particulate matter concentration to account for other sources of particulate matter not associated with either mine. The analysis estimated the maximum direct impact to PM_{10} concentrations due to the West Elk and Oxbow mines, as well as the resulting ambient air concentrations due to other sources (i.e., the two mines plus the background). The analysis used conservative assumptions in order to ensure that the analysis would not underestimate the particulate matter emissions. The results are shown in Table 3.1e. The maximum predicted concentration of PM_{10} due to the mines and other background sources was 148 $\mu g/m^3$, which is below the primary ambient air quality standard. These results indicate that the area around the mine can be expected to remain within ambient air quality standards for $PM_{10.}$

Table 3.1e. Maximum Predicted PM_{10} Impacts Due to West Elk Mine and Oxbow Mines

Averaging Period	PM10 Model Predicted Impact Due to Mining ($\mu g/m^3$)	Back-Ground ($\mu g/m^3$)	Total Pm-10 Impact ($\mu g/m^3$)	Primary National Ambient Air Quality Standard ($\mu g/m^3$)
24-Hour Average (1st Highest)	118.89	29.0	147.89	150
Annual Average (1st Highest)	16.99	16.0	32.99	50

The mine is required to periodically submit an air pollution emission notice (APEN) with updated emissions information. The APEN included actual particulate matter emissions (both PM_{10} and $PM_{2.5}$) due to mine operations for 2010. The particulate matter emissions were determined by applying emissions factors to the actual coal production for the year. An emissions factor is a number that estimates emissions of a pollutant from an air pollution source for each unit of activity, such as an hour of operation, a vehicle mile traveled, or a ton of coal produced. The actual values for the particulate matter emissions are presented in Table 3.1f. The table demonstrates that the actual particulate matter emissions in 2010 were within the permitted limits. Coal production for 2010 was also below permitted limits, at 4.8 million tons of coal.

Table 3.1f. West Elk Stationary Source Particulate Emissions Reported by Air Pollution Emissions Notice for 2010.

	2010 Emissions (tons)	
Emissions Source	PM10	PM2.5
Coal processing operations	77.8535	40.1705

In addition to the particulate matter emissions sources discussed above, there is one permitted stationary source at the mine that has the potential to emit SO_2, NO_2, CO, and volatile organic compounds as well as particulate matter. This source is an emergency generator that was installed in 2010. This generator is limited by the state permit to no more than 500 hours of operation per year. The last APEN, submitted in 2010, contained estimated maximum potential emissions due to the operation of the generator. Additional stationary source emissions for the permitted emergency generator, as well as two exempt (unpermitted) generators, are listed in Table 3.1g. Table 3.1g also lists emissions for miscellaneous exempt heating equipment and a diesel storage tank located at the mine.

In addition to the stationary sources there are mobile sources of emissions that are not permitted by the state. These mobile sources include above ground and underground mining equipment. Because a detailed listing of all pieces of equipment, along with important characteristics of the equipment such as age and horsepower, is not available, an exact calculation of emissions from mobile source equipment at the mine cannot be determined. In lieu of this information the BLM used the EPA's NONROAD 2008a model (http://www.epa.gov/otaq/nonrdmdl.htm) to estimate the maximum potential emissions from mobile sources located at the mine based upon the amount of diesel fuel used and its average carbon content. The model takes into account the average temperature and

elevation of the area being analyzed. The BLM assigned the mobile sources to specific source categories applicable to underground and surface mining operations and applicable to the counties in which the mine is located. The analysis assumes uncontrolled emissions and therefore provides a conservative estimate of the maximum potential for emissions from the mobile sources at the mine based upon the quantity of diesel fuel used at the mine in 2011. (For further details on how the analysis was performed, see Appendix A.) The resulting estimates are presented in Table 3.1g.

Table 3.1g. Estimated Stationary and Mobile Source Emissions for Equipment Located at the Mine (in tons).

Mobile Sources[1]	Particulate Matter		Non-methane Organic Gas **NMOG**	Carbon Monoxide **CO**	Nitrogen Oxides ($NO+NO_2$) **NO_X**	Sulfur Dioxide **SO_2**	Carbon Dioxide **CO_2**	Methane **CH_4**	Nitrous Oxide **N_2O**
	PM_{10}	**$PM_{2.5}$**							
Underground Mining Equipment	12.64	12.26	19.37	74.77	88.82	1.21	5,613.98	0.29	0.14
Surface Mining Equipment	1.90	1.84	2.31	12.27	26.24	0.41	1,908.74	0.04	0.05
Stationary Sources									
Diesel Storage Tank[2]			1.99						
Emergency Generators[3]	0.39	0.39	0.66	5.03	10.34	0.13	1,007.47	0.05	
Heating Equipment[2]	4.30	4.36	2.41	35.70	43.88	0.59	51,920.29	0.97	
Total	19.23	18.85	26.74	127.77	169.28	2.34	60,450.48	1.35	0.19

[1] Mobile sources emissions are for exhaust only.
[2] These are exempt sources.
[3] Includes emissions from three generators, one that is permitted (permit 10GU1130) and two that are exempt

The final emissions group includes emissions from the construction and operation of methane drainage wells. Although it is not a criteria pollutant, methane is a greenhouse gas, approximately 21 times more effective than carbon dioxide in terms of its warming potential. Methane is created during the process of coal formation and remains stored in the coal seams and surrounding rock layers. Shallow coal seams, such as those mined via surface mining operations, contain less methane because there is less pressure due to the overburden (i.e., the rock and soil lying on top of the seam) to keep the methane from escaping. Methane is released to the atmosphere when a coal seam is fractured during surface or underground mining. The amount of methane released by mining depends on the carbon content of the coal, the depth of the coal seam (deeper seams generally contain more methane), and the type of mining being conducted. As mining operations progress into different areas of the mine, it is necessary to vent accumulated methane to the atmosphere to prevent concentrations from building up to levels that could result in underground explosions. The main mine ventilation air system serves this purpose but may become inundated with high concentrations of methane[3]; therefore, the mining company drills additional methane ventilation wells to allow methane from the area being mined to be vented to the atmosphere.

Methane is vented from coal mines because it is explosive above 5% concentration (http://www.epa.gov/cmop/faq.html, & Canadian Center for Occupational Health and Safety, 2011). The primary environmental concern over methane venting is its contribution to global greenhouse gas emissions. . For a general discussion of greenhouse gases and climate change, see the section on Cumulative Effects and Climate Change below.

As methane escapes the enclosed space of the mine through vent shafts and vent wells, the gas is rapidly dispersed and diluted with ambient air. Methane vented from the mine is not expected to affect the local environment because it is considered biologically inert (Committee on Toxicology, Board on Toxicology and Environmental Health Hazards, Commission on Life Sciences, National Research Council, 1984). Methane acts as a simple asphyxiant in very high concentrations, displacing oxygen (Committee on Toxicology, Board on Toxicology and Environmental Health Hazards, Commission on Life Sciences, National Research Council, 1984). Methane vented to the atmosphere is effectively diluted, removing any concern of oxygen displacement for respiratory animals. Methane is nontoxic to plants at normal concentrations. (Personal communication, Jeff Sorkin and Dr. Robert Musselman, Plant Physiologist, Rocky Mountain Research Station, April, 16th, 2012)

The amount of methane released by the West Elk Mine has varied considerably over the life of the mine, and is not well correlated with production levels. In general, the amount of methane released has decreased as the mining operations have progressed into a shallower seam, but there is no clear relationship that would make it possible to accurately predict the amount of methane that will be released to the atmosphere during future mining operations. However, during the period from July 2010 through June 2011 the methane released from the West Elk Mine (including methane from drainage wells and ventilation air) was approximately 58,663 tons. In terms of carbon dioxide equivalents, the warming potential of this quantity of methane in the atmosphere is approximately equal to that of 1,231,923 tons of carbon dioxide (http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results).

There are some technologies for mitigating release of methane from coal mines that can be used under some circumstances. In 2009 the BLM Colorado State Office, Deputy State Director, Energy, Lands, and Minerals requested that Mountain Coal Company prepare an economic evaluation report to supplement their existing Resource Recovery and Protection Plan report to address coal mine methane management options at the West Elk Mine[4]. To support an independent analysis of alternatives for methane management, the company retained several consultants to address the options discussed. Several potential technologies that might be used to mitigate methane releases were examined in the report. The results are discussed below.

Flaring the ventilation air methane (i.e., methane vented via the main mine ventilation system) does not appear to be a technologically feasible option due to the high volume of air flow and dilute concentrations of methane. Any option to control ventilation air methane through flaring would result in additional undesirable air impacts from the combustion of make-up fuel that would need to be added to fully oxidize methane within the VAM stream.

A detailed assessment of the capture and centralized collection of methane drainage well (MDW) methane was included. The report also included an analysis of the potential for flaring methane from the drainage wells. The

[3] Methane emitted from the main mine ventilation system is known as ventilation air methane, or VAM.
[4] *West Elk E-Seam Gas Economic Evaluation Report*, Mountain Coal Company, LLC, September 24, 2009.

overall assessment indicated that the costs for the project, additional potential environmental impacts, regulatory concerns, and the safety considerations below, do not warrant additional detailed analysis at this time. Although flaring may reduce the global greenhouse gas burden, the flaring option is potentially the least desirable methane mitigation option based upon both and environmental and economic efficiency concerns.

The use of flaring to reduce the effects of greenhouse gases on climate change would also have to be approved by the Mine Safety and Health Administration (MSHA), which has the regulatory authority to approve proposed flaring systems intended for use at coal mines in the U.S. The MSHA would need to conduct a thorough review of the proposed flaring system in order to establish the requirements for the system. Currently there are no flaring operations or proposed test operations at active coal mines in the United States. It is not likely that a thorough review, and approval, would occur prior to the development and operation of the mine expansion. If flaring was approved an environmental review would be addressed in a modification to the mine operations permitting.

Another potential methane emission reduction strategy would be to reduce the potential greenhouse gas emissions of the project through methane capture. With respect to the ventilation air methane, no technology currently exists or has been demonstrated to have the capability of handling the volume of ventilation air and dilute concentrations of methane at the West Elk mine to make capture economically feasible. In 2009 the Department of Energy (DOE) released the results of a study to simulate ventilation air methane capture using a non-producing mine (U.S. Department of Energy Cooperative Agreement DE-FC26-02NT41620, at http://www.epa.gov/cmop/docs/vam_executive-summary.pdf). The project demonstrated continued advancements and a viable solution for coal mine ventilation air methane control. However, according to the study the "system is only economically feasible when there is value for greenhouse gas emission reduction", which implies that carbon credits, a cap and trade system, or another market or regulatory based incentivized system (discussed below) for reducing greenhouse gases would be required. There is currently no such system in place in the United States. Non-monetary, voluntary systems exist, but are not specified by regulation and are not tied to permitting, and therefore there is no effective economic incentive. The DOE assessment included carbon credits in their economic feasibility model, which provided a cost basis for controlling ventilation air methane at rates up to 180,000 cubic feet per minute.

The analysis also examined the potential for capturing and/or conditioning the drainage well methane for use on site as fuel for a cogeneration facility (i.e., to produce electricity for sale to the grid) or for sale as pipeline quality natural gas. The study evaluated the gas characteristics and potential quantities of methane that would be realistically produced based on existing well data and testing. This information was then used to engineer a collections system that including options for pipelines, screw compressor configurations for pressure management, dehydration units, control systems, values, and metering. Options for energy generation equipment included reciprocating internal combustion engines (RICE) and combustion turbines. Additional gas processing equipment options for rendering natural gas from the drainage well methane were also presented. The analysis covered multiple scenarios for multiple configurations of equipment. Drainage well methane capture infrastructure would include more miles of road and pipeline construction and surface disturbance than would occur under current operational practices.

For energy production, the RICE proved to be the closest potential candidate for any onsite energy production. The analysis for the production of natural gas from coal mine methane indicated that the levels of contaminants in the gas (including carbon dioxide, oxygen, and nitrogen) were treatable, but that the cost of treatment of the gas, the cost of gas compression, and the distance to access available existing pipeline systems were prohibitive for delivery of the gas as a saleable product. Additionally, the time that it would take to exercise the option would go beyond the timeframe it would take to mine the proposed lease tract. Since this mining project would be an addition to an existing mine, uninterrupted mining would need to take place for this project to be economically viable. For these reasons, methane capture is not a feasible option for mitigation of methane emissions.

Another option for methane emission mitigation would be to use the ventilation air methane. The report provided an assessment of one potential technology, regenerative thermal oxidation (RTO), which could potentially control such dilute levels of ventilation air methane. The technology incorporates adsorption media at the gas inlet to separate out and concentrate the ventilation air methane exhaust to the saturation point of the adsorption media. When fully saturated the media is then regenerated by heating and releasing contaminates from the media, which are fully oxidized via combustion in the process. This process would also require the addition of make-up fuel and would emit non-insignificant quantities of criteria pollutants. While this technology would reduce the global warming potential of the ventilation air emissions (by converting methane to carbon dioxide), it offers no options for energy recovery or use of the resource, and is thus not an economically feasible option for mitigating methane release.

A final option for mitigating the global warming potential associated with the release of methane from the mine would be the purchase of emissions offsets and carbon credits. However, there are currently no markets for these products beyond voluntary markets within the United States and no regulatory framework or incentives (permitting or otherwise) to support a trading system, and thus this is also not a feasible mitigation strategy.

The mine is, however, taking other steps to reduce methane emissions. The mining company is a participant in EPA's Coalbed Methane Outreach Program, which is a voluntary program whose goal is to reduce methane emissions from coal mining activities (http://www.epa.gov/cmop/). By working cooperatively with coal companies and related industries, the program helps to address barriers to using coalbed methane instead of emitting it to the atmosphere. In turn, these actions mitigate climate change, improve mine safety and productivity, and generate revenues and cost savings. The West Elk Mine began recovering methane in 2003 to heat mine ventilation air on site. In 2006, the EPA estimated that the mine recovered and used approximately 170 mmcf of methane, although the exact amount was not measured (*Identifying Opportunities for Methane Recovery at U.S. Coal Mines: Profiles of Selected Gassy Underground Coal Mines 2002-2006*).

In addition to methane, other organic gases are released through methane drainage wells in small amounts. There are very few data regarding the types of gases released through drainage wells other than methane. However, one study that was completed as part of the economic evaluation report discussed above also included an analysis of the concentrations of other constituents emitted through the methane drainage wells. This study sampled the exhaust coming from existing methane drainage wells and performed an analysis to determine its constituents. Two samples were collected and analyzed. Table 3.1h shows the major constituents listed in the report.

Table 3.1h. Analysis of methane drainage well samples.

Gas Component	Concentration Units	Sample ID V18-E1-38 15 May 2009 0851	Sample ID V14-E1-42 15 May 2009 0840
Methane	%	60.7	34.5
Carbon dioxide	%	1.5	2.3
Nitrogen	%	28.9	50.5
Oxygen	%	7.8	11.9
Ethane	%	0.91	0.62
Propane	%	0.177	0.106
i-Butane	%	0.023	0.027
n-Butane	%	0.028	0.023
i-Pentane	%	0.0129	0.0094
n-Pentane	%	0.005	0.0038
Hexane+	%	0.0232	0.007
GHV, dry (14.73 psi)*	Btu/scf	639	366
Relative density *		0.739	0.856
NMHC (Non-Methane Hydrocarbons)	% C	1.376	0.893
	mg/M^3	0.697	0.453
Total sulfur	ppmv	0.65	0.192
	mg/M^3	0.84	2.6
Total organic silicon	ppmv	0.22	0.19
	mg/M^3	0.26	0.23
Total organic chlorine	ppmv	<0.10	<0.10
	mg/M^3	<0.15	<0.15
Total organic fluorine	ppmv	<0.1	<0.1
	mg/M^3	<0.08	<0.08

* Calculation based on 4 major components, 60o F, 14.73 psi ppmv=parts per million by volume mg/M3=milligrams per cubic meter BTU/scf=British Thermal Units per standard cubic foot % C=percent carbon			
* Calculation based on 4 major components, 60^{o} F, 14.73 psi			
ppmv=parts per million by volume			
mg/M^3=milligrams per cubic meter			
BTU/scf=British Thermal Units per standard cubic foot			
% C=percent carbon			

Due to the limited number of samples available (two) taken on one individual day (15 May 2009) within a relatively short period of time, it is not known how accurately these values represent average or potential emissions of various non-methane hydrocarbons and other gaseous compounds. As the emissions of methane have proven to be highly variable and not closely related to coal production levels, it is reasonably likely that emissions of other non-methane constituents will be highly variable as well. For this reason no attempt is made here to quantify all non-methane emissions on an annual basis.

There are also emissions associated with the construction of access roads and well pads, and drilling of methane drainage wells. These activities will continue for the remaining lifetime of the mine even if the parcels under consideration are not leased. Under the proposed action, it has been estimated that up to 48 drainage wells may be required over a period of 1.6 years, which corresponds to a rate of 30 per year. It was therefore assumed under this analysis that up to 30 wells and pads might be constructed per year along with 6.5 miles of roads, resulting in a total of 73 acres of disturbance, even under the no action alternative. This is a conservative assumption when compared with historical activities. During 2011, there were just 14 drainage wells constructed at 10 pad locations. Typically 4-6 mine drainage wells are active at any given time. The mining company reclaims well pads and roads when no longer needed. The total, current, actual surface disturbance is approximately 400 acres of more than 17,140 acres in the currently permitted West Elk Mine area (prior to adding the lease modification areas). This figure includes the West Elk Mine's entire site including disturbance on private lands. As of May 2012, 71 acres have been backfilled, graded, and topsoiled. Five acres were reclaimed in 2011.

Given these assumptions, the emissions associated with road construction, well pad construction, and well drilling were estimated using a spreadsheet developed from EPA's document AP 42, *Compilation of Air Pollutant Emission Factors* (http://www.epa.gov/ttnchie1/ap42/), and the EPA NONROAD 2008a model. The construction and drilling of roads and drainage wells is contracted by the mining company, so the exact mix of equipment may vary slightly from the equipment assumed in this analysis. The analysis took into account dust and tailpipe emissions of typical road construction equipment (including a blade, backhoe and roller), one truck mounted drill rig, support vehicles (such as a water truck), and pickup trucks used for well inspection visits. It also included wind erosion of exposed road and well pad surfaces. Average emission factors were taken from AP 42 and conservative estimates were used for the amount of time needed to construct well pads and roads. Well inspection visits were assumed to occur twice daily for a period of one week, and then weekly thereafter, for a total of approximately 30 weeks per year. The analysis did not include any assumptions regarding control of fugitive dust emissions from exposed surfaces on roads or drill pads, although the mining company does water these surfaces periodically to suppress fugitive dust emissions. Actual windblown dust emissions are therefore expected to be less than those assumed in this analysis. Table 3.1i summarizes the estimated well pad and road construction emissions that might be expected per year under these assumptions. Values were rounded to the nearest whole number, resulting in zero values for some types of emissions. It can be seen from the table that the construction-related emissions are relatively small.

Table 3.1i. Total estimated annual emissions from road and drainage well construction and maintenance

Activity	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOC	HAPs	CO_2	CH_4	N_2O	CO_{2eq}	CO_{2eq} metric Tonnes
Well Pad and Road Construction - Fugitive Dust	11	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	0	0	1	0	0	0	0	153	0	0	153	139
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	1	0	0	0	0	0	0	3	0	0	3	3
Sub-total: Construction	**16**	**2**	**1**	**0**	**0**	**0**	**0**	**155**	**0**	**0**	**156**	**142**
Well & Pipeline visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	5	0	0	5	5
Sub-total: Operations	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**5**	**5**
Total Emissions	**18**	**2**	**1**	**0**	**1**	**0**	**0**	**160**	**0**	**0**	**161**	**146**

Notes
HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1
CH_4 = methane
CO_2eq=carbon dioxide equivalents
NO_x=nitrogen oxides ($NO+NO_2$)

By comparing the reported and estimated emissions in Tables 3.1f, 3.1g and 3.1i, it is apparent that emissions of criteria pollutants are relatively small in comparison with local emissions in Gunnison and Delta counties presented in Table 3.1d. Emissions in these counties as a whole are not high, as they are rural counties and are relatively sparsely populated. Emissions of ozone precursors, volatile organic compounds and nitrogen oxides (NO and NO_2), are also low. Furthermore, mining operations are presently occurring at rates representative of those expected under the no-action and proposed action alternatives. Although there are few monitors close to the mine, there is no indication from available data that any violations of ambient air quality are occurring in the mine's vicinity. It is therefore not anticipated that continued mining operations expected under any alternative will have any appreciable effect on criteria pollutant levels in the analysis area. For purposes of this analysis, the levels of emissions discussed in previous sections do not warrant further dispersion modeling to assess impacts to criteria pollutants or photochemical modeling analysis to assess impacts from ozone. As noted earlier, ozone formation is a complex non-linear process and cannot be analyzed without taking into account all emissions sources in an area that may have an impact on the area near the mine. Modeling of ozone formation requires a complex photochemical model that is much more time and resource intensive than a dispersion model. Further modeling of the mine's emissions under these circumstances is highly unlikely to yield any significant impacts to atmospheric pollutant concentrations.

Emissions of greenhouse gases, including methane, carbon dioxide, and nitrous oxide (N_2O) are listed in Tables 3.1f, 3.1g and 3.1i. In addition to the figures in these tables, additional emissions of methane from drainage wells were presented in the discussion above. Due to the highly variable nature of the methane emissions from the mine, the figure presented earlier provides only a rough estimate of potential annual methane emissions. Actual methane emissions from future mining activities cannot be accurately predicted. Greenhouse gases, particularly carbon dioxide and nitrous oxide, have the potential to remain in the atmosphere for long periods of time (from tens to hundreds of years) and travel long distances. Their effects are thus widely distributed, rather than localized to the analysis area around the mine, and need to be placed in context with similar emissions on a much larger spatial scale.

For comparison, in 2010 the U.S. emissions of CO_2 (including some natural sources) amounted to roughly 6.3 billion tons, emissions of methane totaled approximately 734 million tons in CO_2 equivalents, and emissions of N_2O totaled roughly 337 million tons in CO_2 equivalents. Total U.S. emissions of greenhouse gases in CO_2 equivalents (including other greenhouse gases) was approximately 7.5 billion tons. When carbon sinks (i.e., losses of carbon from the atmosphere due to processes such as uptake by plants) are considered, net U.S. greenhouse gas emissions to the atmosphere were approximately 6.3 billion tons in CO_2 equivalents. During the same year, gross greenhouse gases emitted in Colorado totaled roughly 142 million tons in CO_2 equivalents, and net emissions (after subtracting carbon sinks) were roughly 113 million tons in CO_2 equivalents. (*Final Colorado Greenhouse Gas Inventory and Reference Case Projection*s 1990-2020, EPA 430-R-12-001 *Inventory of U.S. Greenhouse Gas Emissions and Sinks*: 1990 – 2010, April 15, 2012)

On June 20, 2010, Environmental Protection Agency promulgated a rule known as the Tailoring Rule that subjects some greenhouse gas emitting facilities to permitting under the Clean Air Act. This rule initially focuses on the largest emitting facilities. In order to determine whether the tailoring rule will apply to a facility the permitting authority will need to apply a detailed set of criteria. For this mine, the applicable permitting authority will be the State of Colorado. As of this writing (May 2012), the state has not yet reached a determination as to whether or not the mine will be subject to permitting of its greenhouse gas emissions under the Tailoring Rule. If the state decides that the rule applies to the West Elk Mine, the mine will need to obtain an additional permit for its greenhouse gas emissions and comply with any restrictions listed on the permit. If the USFS receives any additional information prior to publication of the FEIS that indicates the Tailoring Rule will apply to the mine and thus additional permits will be required, this information will be disclosed in the final document.

Indirect Impacts

Mined coal will be transported by rail to various facilities. Transportation by train will result in emissions of pollutants such as carbon monoxide, sulfur dioxide, nitrogen oxides, particulate matter, and volatile organic compounds. Locomotive emissions will also include greenhouse gases such as carbon dioxide. Coal will then be combusted by the destination facilities in order to provide energy for various purposes, principally electricity generation. The types and locations of facilities cannot be determined in advance, and thus there is no way to make reasonable estimates of the amounts of coal that will be burned in any particular facility, or the types and efficiencies of emissions controls that may be present at the destination facility (if any are present). It would therefore be highly speculative to attempt to quantify amounts of greenhouse gases and pollutants that might be emitted when the coal is combusted. In general, it is reasonable to assume that coal combustion will result in

emissions of pollutants including sulfur dioxide, nitrogen oxides, volatile organic compounds, particulate matter, sulfuric acid, and mercury. It is also likely that coal combustion-related emissions will contribute to atmospheric concentrations of ozone and secondary particulates when the proper atmospheric conditions are present. Coal combustion will also lead to the emissions of greenhouse gases, principally carbon dioxide. Most facilities that consume coal do not yet have controls to limit the quantities of greenhouse gases emitted to the atmosphere. The amount of carbon dioxide produced will depend on the carbon content of the coal and the degree to which complete combustion is achieved. In general, assuming complete combustion, 1 pound of carbon combines with 2.667 pounds of oxygen to produce 3.667 pounds of carbon dioxide (http://www.eia.gov/coal/production/quarterly/co2_article/co2.html). Without the ability to know the facilities in which the coal will be burned, however, it is too speculative to attempt to quantify total greenhouse gas emissions that will result from burning the coal that will be extracted from the mine under any of the alternatives.

Proposed Action Alternative Environmental Effects

Under the Proposed Action Alternative, the mining would continue for an additional 1.6 years and additional methane drainage wells would need to be constructed. The emissions associated with the building of the roads and performing well inspections are incorporated into Table 3.1i. The total emissions listed in Table 3.1i are relatively small. Under the Proposed Action Alternative, the direct, indirect, and cumulative impacts that would occur would be the same as those presented under the no action alternative, except that they would continue for an additional 1.6 years.

Cumulative Effects & Climate Change

Cumulative Effects

Emissions from the mine will add to the regional emissions presented in the Gunnison and Delta county emissions table earlier. As the mine is already in operation and the annual rate of coal mining is not expected to increase, the cumulative impacts of the coal mine emissions along with regional emissions are already reflected in the monitoring data presented. The results from the 2010 modeling analysis completed as part of the mine's permit application (see Table 3.1e) contain the cumulative impacts that can be expected to PM_{10} concentrations. Cumulative impacts to visibility were also considered by the state when it completed its regional haze analysis and concluded that impacts from the mine would not be sufficiently large to warrant additional particulate matter controls. Both direct and indirect emissions of greenhouse gases will contribute to regional and national emissions. Because the mine is operating and coal from the mine is being used in various facilities, the figures for national and state greenhouse gas emissions should reflect the cumulative impacts including the mine's operations. Depending upon implementation of an Alternative selected, there may be a reduction (-16.4 months) or an increase (+1.6 years) in duration of emissions compared to baseline because of coal reserves on private or on parent coal leases that may be affected.

Climate Change

According to the U.S. Global Change Research Program (2009), global warming is unequivocal, and the global warming that has occurred over the past 50 years is primarily human-caused. Standardized protocols designed to measure factors that may contribute to climate change, and to quantify climatic impacts, are presently unavailable. As a consequence, impact assessment of specific impacts related to anthropogenic activities on global climate change cannot be accurately estimated. Moreover, specific levels of significance have not yet been established by regulatory agencies. Therefore, climate change analysis for the purpose of this EIS is limited to accounting for GHG emissions changes that would contribute incrementally to climate change. Qualitative and quantitative evaluations of potential contributing factors are included where appropriate and practicable. (Source: http://globalchange.gov/what-we-do/assessment/previous-assessments/global-climate-change-impacts-in-the-us-2009).

For all discussion related to climate change, most of the text was copied directly from government (EPA and State of Colorado) prepared documents that are available to the public. Effects from GHGs may not be measurable for decades or centuries and modeling is very expensive and relies on assumptions. Predicting the degree of impact any single emitter of GHGs may have on global climate change, or on the changes to biotic and abiotic systems that accompany climate change, is not possible at this time. As such, the controversy is to what extent GHG emissions resulting from continued mining may contribute to global climate change, as well as, the accompanying changes to natural systems cannot be quantified or predicted at this time. However, effects are presented in a general manner which we believe consistent with EPA's April 22, 2010 direction to the Rio Grande Field Office of

the BLM (Project file, Earth Justice Comments Exhibit). Local effects are from the *Draft Watershed Vulnerability Assessment Pilot Project, Case Study: Grand Mesa, Uncompahgre and Gunnison National Forests* (April 2011).

Average Temperatures

Accumulation of greenhouse gases (including carbon dioxide) in the atmosphere is *very likely* the cause of most of the increase in global average temperatures (IPCC AR4 WGI 2007). In North America, temperatures have increased by 2°F in the last 30 years, and "human-induced warming has *likely* caused much of the average temperature increase over the past fifty years" (CCSP SAP 3.3 2008, p. 3). Climate models show a 1°F warming in the Western US over the last 30 years in response to greenhouse gas emissions from human activities (anthropogenic). However, no studies have specifically investigated whether the detected trends in Colorado can be attributed to anthropogenic greenhouse gases (http://cwcb.state.co.us/Home/ClimateChange/ClimateChangeInColoradoReport/).

The Intergovernmental Panel on Climate Change (IPCC) estimates it has warmed 1.2 to 1.4°F (0.7 to 0.8ºC) over the past century and projects a further 3 to 7°F (2 to 4ºC) over the 21st century. The increases may appear minor compared to short-term weather changes from night to day and winter to summer. In global climate terms, however, warming at this rate would be much larger and faster than any of the climate changes over at least the past 10,000 years (IPCC Climate Change 2007: The Physical Science Basis). Multiple independent measurements confirm widespread warming in the western United States. In Colorado, temperatures have increased about 2°F in the past 30 years (1977-2006). All regions examined within the state warmed during the last 30 years, except the far southeast corner, in which there was a slight cooling trend. Climate models project that Colorado will warm 2.5°F (+1.5 to +3.5°F) by 2025 relative to the 1950-1999 baseline and 4°F (+2.5 to +5.5°F) by 2050 with summers showing the larger temperature increase (http://cwcb.state.co.us/Home/ClimateChange/ClimateChangeInColoradoReport/). Locally, the temperature is expected to increase by approximately 2-3 ˚C (3.6-5.4 ˚F) by 2050 (Table 3.1j).

Table 3.1j. Temperature and Precipitation Climate Change Scenarios for 2050 developed by Barsugli and Mearns for the Gunnison Basin.

	Precipitation (%)		Temperature (˚C)	
	Moderate Scenario	More Extreme Scenario	Moderate Scenario	More Extreme Scenario
Annual	~0.0	-10.0	+2.0 to +3.0	+3.0
Winter	+15.0	~0.0	+2.0	+3.0
Spring	-12.0	-15.0	+2.5	+3.0
Summer	-15.0	-20.0	+3.0	+4.0
Fall	+4.0	-10.0	+2.5	+3.0

Extreme Temperature

Most scientists think that a warming climate will alter the frequency and severity of extreme temperature events. In general, they expect increases in heat waves and decreases in cold spells. These effects will vary from place to place (IPCC Climate Change and EPA Climate Change Effects, Extreme Events). In Colorado, winter projections show fewer extreme cold months, more extreme warm months, and more strings of consecutive warm winters. Typical projected winter monthly temperatures are between the 10th and 90th percentiles of the historical record. Between today and 2050, typical January temperatures of the Eastern Plains of Colorado are expected to shift northward by approximately 150 miles. In all seasons, the climate of the mountains is projected to migrate upward in elevation, and the climate of the Desert Southwest to progress up into the valleys of the Western Slope (http://cwcb.state.co.us/Home/ClimateChange/ClimateChangeInColoradoReport/). Locally, there are expected to be fewer extreme cold months, more frequent extreme warm months, and more consecutive warm winters (Table 3.1c).

Extreme Weather Events

Because warm sea surface temperatures energize hurricanes, a warming climate is likely to make hurricanes more intense. Hurricanes in the future will probably have stronger peak winds and increased rainfall. The relationship between sea surface temperatures and the frequency of hurricanes is less clear. There is currently no scientific consensus on how a warming climate is likely to affect the frequency of hurricanes, but research continues (IPCC Climate Change and EPA Climate Change Effects, Extreme Events).

In a warming climate, extreme events like floods and droughts are likely to become more frequent. More frequent floods and droughts will affect water quality and availability. For example, increases in drought in some areas may increase the frequency of water shortages and lead to more restrictions on water usage. An overall increase in precipitation may increase water availability in some regions, but also create greater flood potential (IPCC Climate Change and EPA Climate Change Effects, Water).

Hydrology & Precipitation

Rising temperatures will intensify the Earth's water cycle. Increased evaporation will make more water available in the air for storms, but contribute to drying over some land areas. As a result, storm-affected areas are likely to experience increases in precipitation and increased risk of flooding. But areas located far away from storm tracks are likely to experience less precipitation and increased risk of drought. In the U.S., warming is expected to cause a northward shift in storm tracks, resulting in decreases in precipitation in areas such as the Southwest U.S. but increases in many areas to the north and east. However, these changes will vary by season and depend on weather fluctuations (IPCC Climate Change and EPA Climate Change Science, Future Precipitation).

Sea levels are rising worldwide and along much of the U.S. coast. Tide gauge measurements and satellite altimetry suggest that sea level has risen worldwide approximately 4.8-8.8 inches (0.12-0.22 m) during the last century. A significant amount of sea level rise has likely resulted from the observed warming of the atmosphere and the oceans. The primary factors driving current sea level rise include the expansion of ocean water caused by warmer ocean temperatures (warmer water is less dense), melting of mountain glaciers and small ice caps (resulting in more water in the oceans and less on land), and - to a lesser extent - the melting of the Greenland Ice Sheet and the Antarctic Ice Sheet. The Intergovernmental Panel on Climate Change (IPCC) projects a six-inch to two-foot (0.18-0.59 m) rise in sea level during the 21st century. Sea level rise may be greater if there are sudden increases in ice sheet melt. Such increases have already been observed but their effects have not yet been incorporated into current projections of sea level rise. The stability of the West Antarctic Ice Sheet is of particular concern. A sudden collapse of the ice sheet could raise sea levels 16 to 20 feet (5-6 m). The IPCC is unable to estimate the likelihood or timing of such a collapse, however, due to incomplete understanding of all the processes affecting this ice sheet (IPCC Climate Change 2007: Impacts, Adaptation and Vulnerability and EPA Climate Change Effects, Coastal Zones and Sea Level Rise).

Polar regions are expected to warm more than any other parts of the world. In part, this is because ice has greater reflectivity (also known as albedo) than ocean or land. Melting of highly reflective snow and ice reveals darker land and ocean surfaces, which increases absorption of the sun's heat and further warms the planet, especially in those regions. Polar ice sheets (such as those on Greenland and Antarctica) are some of the largest surface features on our planet. Any changes to them, however small, could have far-reaching effects. Polar ice sheets potentially will accumulate more snow and ice because of an increase in precipitation. However, overall melting due to global warming is expected to reduce the size and extent of the polar ice sheets. Melting of polar ice and land-based glaciers is expected to contribute to sea level rise. In addition to the ice sheets, sea ice is also melting. Though the melting of floating sea ice that covers part of the Arctic Ocean does not affect sea level, sea ice is important for wildlife and for keeping the region cool by reflecting sunlight back to space. If the Arctic loses the reflective surface of ice and then the dark Arctic Ocean absorbs more heat, the northern regions may warm even more rapidly (IPCC Climate Change and EPA Climate Change Effects, Polar Regions).

Coastal areas may be impacted by sea level rise and an increase in storm intensity. Rising seas may contribute to enhanced coastal erosion, coastal flooding, loss of coastal wetlands, and increased risk of property loss from storm surges (IPCC Climate Change and EPA Climate Change Effects, Coastal Zones and Sea Level Rise).

Increasing temperatures are projected to affect state water resources. In Colorado, no consistent long-term trends in annual precipitation have been detected. Variability is high, which makes detection of trends difficult. Climate model projections do not agree whether annual mean precipitation will increase or decrease by 2050. The multi-model average projection shows little change in annual mean precipitation, although a seasonal shift in precipitation does emerge. Widespread and large increase in the proportion of precipitation falling as rain rather than snow, and reduction in snow water equivalent (SWE) have been observed elsewhere in the West. In Colorado, however, these changes are smaller and not as significant. Most of the reduction in snowpack in the Western US has occurred below about 8200 ft. However, most of Colorado's snowpack is above this elevation, where winter temperatures remain well below freezing. Projections show a precipitous decline in lower-elevation (below 8200 ft) snowpack across the West by the mid-21st century. Modest declines are projected (10–20%) for Colorado's high-elevation snowpack (above 8200 ft) within the same timeframe. Between 1978 and 2004, the spring pulse (the onset of streamflows from melting snow) in Colorado has shifted earlier by two weeks. Several

studies suggest that shifts in timing and intensity of streamflows are related to warming spring temperatures. The timing of runoff is projected to shift earlier in the spring, and late-summer flows may be reduced. These changes are projected to occur regardless of changes in precipitation. Recent hydrology projections suggest declining runoff for most of Colorado's river basins in the 21st century. However, the impact of climate change on runoff in the Rio Grande, Platte, and Arkansas Basins has not been studied as extensively as the Colorado River Basin. The lowest five-year period of Colorado River natural flow since records began in the late 1800s occurred in 2000 to 2004 (9.9 million acre feet per year). Recent hydrologic studies of the Upper Colorado River Basin project multi-model average decreases in runoff ranging from 6% to 20% by 2050 compared to the 20th century average, although one statistical streamflow model projects a 45% decline by 2050. The range of individual model projections within a single study can include both increasing and decreasing runoff due to the range of climate model output used to drive the hydrology models. Ongoing studies are attempting to resolve methodological differences in order to reduce the range of uncertainty in runoff projections. Throughout the West, less frequent and less severe drought conditions have occurred during the 20th century than revealed in the paleoclimate records over the last 1000 years. Precipitation variations are the main driver of drought in Colorado and low Lake Powell inflows, including the recent drought of 2000–07, and these variations are consistent with the natural variability observed in long-term and paleoclimate records However, warming temperatures may have increased the severity of droughts and exacerbated drought impacts (http://cwcb.state.co.us/public-information/publications/Documents/ReportsStudies/ClimateChangeReportFull.pdf). Locally, under a moderate scenario, no substantial change in annual precipitation, but an increase in cool season precipitation and a decrease in warm season precipitation is expected. And under a more extreme scenario, a 10% decrease in annual precipitation, with greater decreases in warm season precipitation. Under a moderate scenario, a decrease in annual natural stream flows of 5 to 10% is expected due to increased temperature, even if annual precipitation remains the same. And under a more extreme scenario, a decrease in precipitation and increase in temperature both act to reduce annual stream flow totals in the range of 20 to 25%. Warming temperatures lead to a later accumulation of snow in the fall, and earlier snowmelt in the spring. However, because of the increased precipitation in winter, and the generally cold, high-elevation nature of the upper Gunnison basin, the mid-winter snowpack may be similar to the present under a moderate scenario. And under a more extreme scenario, this likely represents a hot/dry scenario for much of the West, the potential exists for more frequent dust deposition events, which also may lead to an earlier melt and to reduced water yield from the snowpack. Under a moderate scenario, snowmelt-driven stream flow will occur earlier in the spring by about a week on average. (Note: this shift is due to warming and does not include the effects of dust-on snow, which can result in an even earlier shift in snowmelt. And under a more extreme scenario, snowmelt-driven stream flow will peak about two or more weeks earlier in the spring, though this effect may be less if dust effects on snowmelt are strong. The combined effects of dust and temperature on snowmelt timing tend to be dominated by the dust effects. For more local effects see Table 3.1k.

Table 3.1k. Projected Climate Changes to the GMUG.

Projected Climate Change	Anticipated Hydrologic Response	Potential Consequences to Resource Values
Warmer Winter/Spring Temperatures Average daily winter/spring temperature expected to increase > 3˚C by 2050.	• Fewer extreme cold months, more frequent extreme warm months, more consecutive warm winters • Later accumulation of snowpack. • Earlier onset of snowpack runoff (1-3 weeks) • Higher winter stream flows • Increased water temperature • Winter precipitation more often rain than snow below 8200 feet • Snowline to move up in elevation.	• Reduced duration of winter snow cover. • Longer period of saturated roadbeds vs frozen roadbeds. • Increased demand for water storage. • Earlier demand for irrigation water. • Decreased summer stream flows. • Potential change to aquatic species reproductive triggers or success. • Increased risk to channel and floodplain infrastructure from higher runoff.

Projected Climate Change	Anticipated Hydrologic Response	Potential Consequences to Resource Values
		• Increased risk to riparian habitat/floodplains from higher flows. • Changes to winter habitat, winter recreation and plant communities.
Warmer Summer Temperatures Average daily summer temperature expected to increase > 3˚C by 2050.	• Increased evapotranspiration • Decreased soil moisture • Reduced summer stream flows • Increased water temperature	• Increased demand for irrigation water. • Shifts in cold water habitat to higher elevations. • Increases in warm water habitat. • Decreased dissolved oxygen in lower elevation streams during the summer. • Aquatic biota mortality and even loss of populations. • Loss of summer stream flow.
Changes in Precipitation At higher elevations may be slightly greater precipitation during the winter, but likely less total precipitation, especially during warmer months.	• May see higher peak flows associated with snowmelt, earlier in the year. • Lower summer and fall baseflows • Increased soil moisture during spring at lower elevations	• Decreased water availability during irrigation season. • Increased risk to channel and floodplain infrastructure. • Reduced riparian vegetation health and vigor. • Increased landslides and slumps on geologically unstable areas. • Increased potential damage to saturated roadbeds. • Reduced aquatic habitat in summer and fall.
More intense storms Warmer atmosphere has potential for increase in frequency and magnitude of big storms	• Localized flooding • Increased debris flows • Increased hillslope and channel erosion	• Increased risk to channel and floodplain infrastructure from sediment and high flows. • Increased concern for public safety. • Increased selenium load in streams where Mancos Shale exposure is significant.

Projected Climate Change	Anticipated Hydrologic Response	Potential Consequences to Resource Values
More frequent and longer periods of drought	• Less soil moisture • Reduced groundwater recharge • Lower summer and fall baseflow	• Increased erosion associated with natural disturbances associated with drought (e.g. fire). • Increased plant stress and susceptibility to insect and disease mortality. • Reduced groundwater contribution to baseflows • Reduced discharge from springs • Reduced wetland/riparian function.
Increase winter dust deposition on snowpack	• Accentuate changes to snowpack melt	• Similar to warmer winter consequences.

Habitats & Species

Some ecosystems have already been affected by changes in climate. As the climate continues to warm, major changes may occur in ecosystem structure and function, species' ecological interactions, and species' geographic ranges, with predominantly negative consequences for biodiversity. Warmer temperatures and precipitation changes will likely affect the habitats and migratory patterns of many types of wildlife. The range and distribution of many species will change, and some species that cannot move or adapt may face extinction. In addition, climate changes such as increased floods and droughts are predicted to increase the risk of extinction for some plant and animal species, many of which are already at-risk due to other non-climate related factors (IPCC Climate Change and EPA Climate Change Effects, Ecosystems and Biodiversity). For local effects see Table 3.1k.

Health

A warming climate will have both positive and negative impacts. Local impacts are the most difficult to predict, making it a challenge to know exactly who or what will be harmed or benefit. Generally, the risk of negative impacts from climate change increases the faster it warms. More rapid climate change makes adapting to change more difficult and costly. This is especially true for vulnerable groups (such as the poor, the very young and older adults) and fragile ecosystems which may struggle to adapt to even small changes. The Intergovernmental Panel on Climate Change (IPCC) suggests that temperature increases above the range of 3.5 to 5.5°F (2 to 3ºC) over the next 100 years would dramatically increase the negative impacts of climate change. So a major aim of climate action is to reduce the risk and likelihood of large, rapid warming (IPCC Climate Change 2007: Impacts, Adaptation and Vulnerability). Longer, more intense and frequent heat waves may cause more heat-related death and illness. There is virtual certainty of declining air quality in cities since greater heat can also worsen air pollution such as ozone or smog. Insect-borne illnesses are also likely to increase as many insect ranges expand. Climate change health effects are especially serious for the very young, very old, or for those with heart and respiratory problems. Conversely, warmer winter temperatures may reduce the negative health impacts from cold weather (IPCC Climate Change 2007: Impacts, Adaptation and Vulnerability and EPA Climate Change Effects, Health). For local effects see Table 3.1k.

Food Availability

The supply and cost of food may change as farmers and the food industry adapt to new climate patterns. A small amount of warming coupled with increasing CO_2 may benefit certain crops, plants, and forests, although the impacts of vegetation depend also on the availability of water and nutrients. For warming of more than a few degrees, the effects are expected to become increasingly negative, especially for vegetation near the warm end of its suitable range (IPCC Climate Change and EPA Climate Change Effects, Agriculture and Food Supply). For local effects see Table 3.1k.

Costs

Warmer temperatures may result in higher energy bills for air conditioning in summer, and lower bills for heating in winter. Energy usage is also connected to water needs. Energy is needed for irrigation, which will most likely increase due to climate change. Also, energy is generated by hydropower in some regions, which will also be impacted by changing precipitation patterns (IPCC Climate Change and EPA Climate Change Effects, Energy Production and Use). For local effects see Table 3.1k.

Recreation

Outdoor recreation activities may benefit from longer periods of warm weather. However, many other outdoor activities could be compromised by increased beach erosion, increased heat waves, decreased snowfall, retreating glaciers, reduced biodiversity, and changing wildlife habitats (IPCC Climate Change and EPA Climate Change Effects, Public Lands, Recreational Opportunities, and Natural Resources). For local effects see Table 3.1k.

3.2 Socioeconomics

3.2.1 Affected Environment

The analysis area for the proposed lease modifications includes Delta and Gunnison Counties. Currently, the West Elk Mine employs 378 employees, and a majority of these employees, as well as their families, live in communities in Delta County. Gunnison County is also included in this analysis because the lease modifications are located within its jurisdiction. Both Counties receive tax and other revenues as a result of the West Elk Mine operations. No major change in direct employment is anticipated at the West Elk Mine in conjunction with the Proposed Action Alternative, assuming annual production is consistent.

Population

Table 3.2a – Population by Category, 2000 and 2010, Delta and Gunnison Counties and the State of Colorado below presents basic population and demographic information for Delta and Gunnison Counties, and for the State of Colorado.

Table 3.2a - Population by Category, 2000 and 2010, Delta and Gunnison Counties and the State of Colorado

Population	Delta County	Gunnison County	Colorado
2000	27,834	13,956	4,302,015
2010	30,952	15,324	5,029,196
Percent Change	**11.2 %**	**9.8 %**	**16.9 %**
Male (2010)	50.4 %	54.2 %	50.1 %
Female (2010)	49.6 %	45.8 %	49.9 %
Under 5 years	5.7 %	5.6 %	7.3 %
Under 18 years	22.1 %	18.1 %	24.4 %
65 years and over	20.2 %	8.8 %	10.9 %
Percent Minority (2010)	17.0 %	10.9 %	30.0 %
Percent Below poverty (2010)	12.1 %	13.9 %	12.6 %

Source: http://quickfacts.census.gov/qfd/states/08/08051.html, see Reference Section: U.S. Census Bureau 2011.

The majority of the workforce for the West Elk Mine, and for supporting businesses, is located within the cities and towns in Delta County. Delta County, which comprises approximately 1,142 square miles, has approximately 24.4 people per square mile and a total population of 30,952 (as of 2010). Between the years of 2000 and 2010, Delta County grew by almost 9 percent. According to the Sonoran Institute (2004), Delta County grew slower than the State of Colorado; however, the County grew faster than the Nation between the years of 1970 and 2000, with an annual average growth rate of 2.7 percent. The median age in Delta County is 42.3 years, with 21.4 percent of the population being under the age of 18; and almost 20 percent of the population being 65 years or older. More than 80 percent of the people age 25 and older in Delta County have graduated from High School, and just over 17 percent have graduated from College (U.S. Census Bureau 2001).

The Town of Delta is the largest town in Delta County. In 2000, the town had a population of approximately 6,400, which was an increase of 75 percent from 1990. Other communities in the County include Cedaredge (with a 2000 population of 1,854); Crawford (with a 2000 population of 366); Hotchkiss (with a 2000 population of 968); Orchard City (with a 2000 population of 2,880); and Paonia (with a 2000 population of 1,497) (U.S. Census Bureau 2000).

In 2009, the U.S. Census Bureau reported that there were 13,391 housing units in Delta County that housed 11,058 households, indicating a vacancy rate of approximately 17 percent. Only 3.7 percent of the vacant houses are classified as seasonal, recreational, or for occasional use. Approximately 8 percent of rental units were classified as vacant. There were approximately 2.43 persons per household. In 2000, Delta County had a home ownership rate of 77.5 percent, which was well above the State average of 67 percent. The median value of an owner-occupied housing unit was $115,500, which was well below the State average of $166,600 (U.S. Census Bureau 2001).

Local Economic Impact

The analysis area for the Proposed Action, in relation to economic resources, includes Delta and Gunnison Counties. Most of the personnel employed directly at the West Elk Mine live in Delta County, and most of the businesses and services that provide indirect support to the mine are in Delta County. The indirect businesses that provide support services to the West Elk Mine operations include shipping companies, railroad and rail services, power generating companies, delivery services, and general supply companies and services. Delta County receives the indirect financial benefit and tax revenue from the indirect businesses that support the mine, and the tax base from the workers, and their families, that reside in the County.

The West Elk Mine, the location of the Proposed Action, is in Gunnison County. Gunnison County receives approximately $2 million annually in tax revenues as the result of the coal mining operations at the West Elk Mine. Mining companies are the largest property tax revenue sources for Gunnison County. Gunnison County has identified the areas surrounding the coal mines as the *North Fork Valley Coal Resource Special Area.*

In 2009, Delta and Gunnison Counties, taken together, supported approximately 25,316 full- and part-time jobs, which was an increase of 16,804 jobs from 1970. In Gunnison County, approximately 600 of its 9,004 wage and salary jobs are in the mining sector, which was an

increase of 285 jobs from 1970. In 2000, mining employment in Delta County was not reported in U.S. Census Bureau documents because the data was suppressed for confidentiality reasons (Sonoran Institute 2004). In 2009, the unemployment rate in Gunnison County was 4.9 percent, which was much lower than the Statewide average of 8.4 percent for the same period. During the same period, the Delta County unemployment rate of 7 percent was also lower than the Statewide average. (Source: http://www.bls.gov/lau/laucntycur14.txt; see Reference Section: U.S. Bureau of Labor Statistics 2011).

In 2004, the West Elk Mine employed approximately 378 full- and part-time workers, with an annual payroll of approximately $29 million (MCC 2004). In 2001, average mining wages were $50,705, which was more than twice the average wage for other employment sectors in the project area ($23,254). Arch Coal (MCC's parent company) estimates that for every 1 coal job 7 service-sector jobs are supported (MCC 2004). In 2003, the West Elk Mine spent approximately $32 million locally for materials, supplies, and services; royalty and tax payments totaled approximately $13 million (MCC 2004). Total direct economic local direct economic benefits associated with the West Elk Mine exceed $70 million annually (USDA FS 2004).

Benefit-Cost Analysis

The field of benefit-cost analysis attempts to take a holistic inventory in relation to the implementation of the Proposed Action. The overall economic benefits are weighed against the overall economic costs, taking a wider view than that of the local economic impacts. For the proposed coal lease modifications, 1.6 years (19 months) of additional coal mining activity was examined, with the following conclusions:

- **Benefits --**
  - approximately $400 million recovered in coal (at $40/ton)
  - approximately $46.4 million in payroll;
  - approximately $64.2 million in material, supplies, and services;
  -
  - approximately $32 million in royalties (at 8%)

- **Costs --**
  - approximately $8 million in GHG emissions [383,000 tons of CO_2 equivalent methane * $21 per ton of CO_2) (Interagency Working Group 2010)];
  - minor costs due to 73 acres of disturbance on National Forest System Lands (resulting in temporary impacts to hunting, recreation, wilderness character, aesthetics, and livestock grazing, as well as possible impacts to water quality)

3.2.2 Environmental Impacts Analysis

The No Action Alternative

Under the No Action Alternative, the coal lease modifications would not be approved; therefore, the coal included in the modifications under the Proposed Action or the Proposed Action Alternative (approximately 10.1 million tons of recoverable coal) would not be mined and the economic and fiscal benefits associated with mining that coal would not be realized by the State or by the Federal government. Currently, approved mining operations and associated economic benefits would continue on the existing West Elk Mine leases; however, these operations would cease earlier than they would if the Proposed Action or the Proposed Action Alternative were approved; and approximately 10.1 million tons of coal would be permanently bypassed. Job losses, including those directly associated with the mine operations, as well as those associated with secondary jobs supported by the mine, would occur following the cessation of operations. The reductions in jobs and associated salaries, local expenditures, and royalty and tax payments would not be realized until after the reserves are depleted. The revenue (taxes and royalties) generated from the sale of the coal from the lease modifications would be lost.

The modifications to the West Elk Mine coal lease also provide access to coal in the current leased tracts; access that, without the approval of the modifications, could become inaccessible. The approval of the Proposed Action or the Proposed Action Alternative combined with current leased tracts could provide for a total of 10 years to 12 years life of mine on Federal and private coal reserves. Under the No Action Alternative the Federal government (the U.S. Treasury Department) would not receive the rents and royalties associated with mining the coal in the lease modifications.

The Proposed Action Alternative

Under the Proposed Action the West Elk Mine would continue mining operations using the existing workforce, equipment, and facilities. There would be no new or added employment at the West Elk Mine and no additional demand for housing or municipal services would be anticipated. Mining operations would be extended about 1.6 years in order to mine recoverable coal reserves in the E-Seam.

The BLM estimates that the E-Seam coal in the lease modifications would be mined interspersed with coal from existing leases from the year 2013 through 2016 (with some variations to these timeframes potentially occurring based upon timeframes for permitting, unforeseen mining or geologic circumstances, coal contract variability, etc.). This extension of mining operations would also extend the annual payroll, local expenditures, and taxes and royalty payments for approximately 1.6 years. The local economic impacts noted above from payroll, materials, supplies, and services associated with continued mining would equal approximately $5.83 million per month, which equates to approximately $110.6 million for the 19-month life of mine extension. The BLM receives annual payments from coal lease holders based upon rents at not less than $3.00 per acre. The rental rates are specified in the lease.

Royalty payments are 8 percent of the value of the coal removed from an underground mine (43 CFR 3473).

Royalties from the Federal coal are distributed in the following way:

- 50 percent returns to the Federal treasury in the General Fund;
- 50 percent returns to the State where the coal was mined, with a portion of that percentage being returned to the County where the coal was mined.

In Colorado, those funds are managed by the State Department of Local Affairs in the Energy Impact Fund. These monies are distributed on a grant-like basis to Counties affected by energy resource development for community benefit projects.

Alternative with Design Features

Under the Proposed Action Alternative (alternative with design features), the West Elk Mine would continue mining operations using the existing workforce, equipment, and facilities. There would be no change in the number of employees needed in order to implement this Alternative. As under the Proposed Action, there is also the assumption that if there is no addition to the workforce, there will be no additional demand for housing or municipal services. Mining operations would be extended throughout the period required to mine recoverable coal reserves in the E-Seam.

The BLM estimates that the E Seam coal in the lease modifications would be mined interspersed with coal from existing leases from the year 2013 through 2016 (with some variations to these timeframes potentially occurring based upon timeframes for permitting, unforeseen mining or geologic circumstances, coal contract variability, etc.). This extension of mining operations would also extend the annual payroll, local expenditures, and taxes and royalty payments for approximately 1.6 years. The local economic impacts noted above from payroll, materials, supplies, and services associated with continued mining would equal approximately $5.83 million per month, which equates to approximately $110.6 million for the 19-month life of mine extension. The BLM receives annual payments from coal lease holders based upon rents at not less than $3.00 per acre. The rental rates are specified in the lease.

The cost to the West Elk Mine of implementing control measures in the form of stipulations as part of this alternative would be minor. The costs would not significantly reduce the economic benefit to the local economy.

3.3 Environmental Justice

3.3.1 Affected Environment

Executive Order (EO) 12898 (February 11, 1994), Federal Actions to Address Environmental Justice in Minority and Low-Income Populations was executed in order to avoid a disproportionate placement of adverse (negative) environmental, economic, social, and/or health impacts resulting from Federal actions and policies on minority and low-income

populations. Low-income populations are households where the people live below the subsistence or poverty level, as defined by local, States, and/or by the Federal government. The EO also directs Federal agencies to avoid making decisions that discriminate against these communities. Environmental justice means that, to the greatest extent practicable and permitted by law:

- populations are provided the opportunity to comment before decisions are rendered on; and

- populations are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by government programs and activities affecting human health or the environment.

Analysis for the Proposed Action *and* the Proposed Action Alternative requires the identification of minority and low-income populations that may be affected by any of the alternatives. The area of influence for environmental justice for the Proposed Action *and* the Proposed Action Alternative is Delta County, Colorado, where the majority of West Elk Mine workers, and their families, live. Demographic information on ethnicity, race, and economic status is provided in this section as the baseline against which potential impacts can be identified and analyzed.

Identification of Minority and Low-Income Populations

For purposes of this analysis, minority and low-income populations are defined as follows:

- **Minority Populations --** Minority populations are persons of Hispanic or Latino origin of any race; Blacks or African Americans; Native American Indians or Alaska Natives; Asians; and Native Hawaiian and other Pacific Islanders.

- **Low-Income Populations --** Low-income populations are persons living below the poverty level. In 2000, the poverty weighted average threshold for a family of 4 was $17,603 and $8,794 for an unrelated individual. Estimates of these two populations were then developed in order to determine if environmental justice populations exist in Delta County (see Table 3-7).

In 2009, Delta County had a population of 31,322 persons, of which approximately 5,137 (16.4 percent) were minorities; and approximately 3,790 (12.1 percent) were living below the poverty level. Minority populations were lower in Delta County than in the State of Colorado; the low-income population in Delta County was higher than for the State of Colorado. The CEQ identifies minority and low income groups as Environmental Justice populations when either:

1. the population of the affected area exceeds 50 percent, or

2. the population percentage in the affected area is meaningfully greater (generally, taken as being at least 10 percent more) than the population percentage in the general population of the region or State.

Neither the minority population percentage nor the low-income population percentage meets the CEQ guidelines. As a result, it is assumed that no Environmental Justice populations exist within the area of influence; therefore, no impact analysis is required.

Protection of Children

EO 13045 (April 21, 1997), Protection of Children from Environmental Health Risks and Safety Risks, recognizes a growing body of scientific knowledge that demonstrates that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because:

- children's bodily systems are not fully developed;
- children eat, drink, and breathe more in proportion to their body weight that adults;
- children's size and weight may diminish protection from standard safety features; and
- children's behavior patterns may make them more susceptible to accidents.

Based upon these factors, the President directed each Federal agency to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect (impact) children. The President also directed each Federal agency to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

In relation to the Proposed Action and the Proposed Action Alternative, children are seldom present at the coal mining facilities at the West Elk Mine. On occasions where children are present, MCC has taken, and will continue to take, precautions for the safety of children. This includes such precautions as fencing, limitations on access to certain areas, and provision of adult supervision; therefore, no additional impact analysis is required.

3.4 Cumulative Impacts Summary

The geographic scope is focused on the North Fork Valley from east of the town of Delta, north to the Mesa/Delta County line, east to the Pitkin County boundary, then south and west along the watershed for the North Fork of the Gunnison River. This area is approximately 566,700 acres in total with National Forest being 57% (322,400 acres), BLM 11% (61,150 acres), and private land 32% (182,150 acres). A portion of the private land has the mineral estate reserved to the United States in the patents.

Past Actions. The primary existing (past) disturbances within the proposed leases are associated with mining, oil and gas, livestock grazing, and residential/agricultural development.

Historic mining activities over the past century include the following:

- Hawks Nest Mine;
- Oliver Mine No. 1 and No. 2;
- Bear Mine No. 1, No. 2, and No. 3;
- Edwards Mine;

- USS Steel Mine;
- Blue Ribbon Mine;
- King Mine;
- Farmers Mine;
- Oxbow Sanborn Creek; and
- Bowie No. 1 Mine (a.k.a. Orchard Valley Mine).

Over the last century, there has been noticeable subsidence in a number of areas above the historic mines. However, there has been no known damage to overlying resources or to structures attributable to this subsidence. Subsidence may have aggravated or contributed to some landslide movements, but this is difficult to identify given the pre-mining instability of many areas of the valley.

Past oil and gas activity within the region has included coal-bed methane wells and conventional gas wells. The wells within approximately 20 miles of the lease modification areas include:

- 56 total wells drilled. 25 are on private surface/private minerals; 11 are split-estate wells; 20 are on U.S. Forest Service; and no wells are on BLM surface.
- 20 wells are producing and 31 are shut-in.

Present Actions. Present actions are focused on mining, oil and gas, livestock grazing, and residential/ agricultural development.

Table 3.4a contains recent production data for the three coal mines in the North Fork Valley.

Table 3.4a - Raw Coal Production - North Fork Valley (NF) - BLM-UFO
1 Year Averages

Average based on:	Bowie No. 2	Elk Creek	West Elk	Totals (NF)
5 Year	2,808,556	4,378,814	5,721,944	12,909,314
1 Year	1,873,357	3,495,575	6,499,048	11,867,980
Periods end Sept. 30, 2011				

NOTE: The total yearly production for the North Fork Valley is expected to remain about the same between 12 and 13 million tons. This would result in approximately 3 unit trains per day of 105 cars per unit entering and leaving the North Fork Valley. Each of these mining operations control coal reserves with a mix of Federal and fee coal; however, 90 percent or more of local production is Federal. As mining progresses, only Federal coal will be available in the reserve base.

- Bowie No. 2 was opened in 1997 as a room-and-pillar mine but converted to a longwall system in late 1999. It is located northeast of Paonia and is operated by Bowie Resources, LLC with a train loadout northeast of Paonia. There are 14,543 acres permitted in the combined permits of the Bowie No. 1 and No. 2 accessed by the Bowie No. 2 mine.
- The Elk Creek Mine is a longwall operation north of Somerset, operated by Oxbow Mining, LLC, with a train loadout immediately north of Somerset. There are 13,429 acres permitted.
- The West Elk Mine is a longwall operation located south and east of Somerset and is operated by Mountain Coal Company with a loadout about 1 mile east of Somerset. There

are 17,155 acres permitted and the mine is about the 7th largest underground longwall coal mine in the U.S.

The North Fork Branch of the Union Pacific Railroad operates exclusively to serve these coal mines. This line branches from the main line in Grand Junction and passes through Delta, Hotchkiss, Paonia, and Somerset.

On a cumulative analysis basis, the West Elk Mine, as well as the other 2 underground coal mines operating in the North Fork Valley, has a considerable impact on the local economy. Approximately 1,028 coal miners are employed directly by the 3 mines, and an additional 1,748 people in the local area derive their employment from the miner's income, as well as from the purchases of supplies by the mines themselves. The West Elk Mine is responsible for approximately one-third of this overall effect, and the proposed lease modifications will allow the mine to continue operations for 19 additional months. If the lease modifications were not approved, and not offered for sale, nearly 1,000 people in the local area would lose their employment 19 months sooner than they otherwise would.

Continued operation of the coal mines in the North Fork Valley provides a direct beneficial impact to the local economy. Impacts to businesses that do not depend upon the direct business from resource extraction are more difficult to measure. There may be minor impacts resulting from the continued mining of non-renewable resources in the North Fork Valley. The impacts would be temporary, consistent within the timeframe of the mining operations.

Oil and Gas Leasing. There are approximately 418,469 total acres of federal oil and gas mineral estate within the cumulative impacts area. Approximately 124,192 unleased acres are within inventoried roadless areas which, due to on-going litigation, may have surface use restrictions related to road building if ever nominated for leasing. Overall, there are 173,646 acres currently leased. This includes 54,580 acres of inventoried roadless areas which were leased prior to implementation of the USFS roadless rule. If these pre-2001 leases expire and are subsequently leased again, they will have surface use restrictions for whatever roadless rule may be in place. Approximately 120,631 acres of Federal oil and gas mineral estate remains available for nomination to be leased at this time.

Reasonably Foreseeable Actions.

Underground coal mining would continue in the North Fork Valley. In addition to existing coal leasing and exploration activities, the following are reasonably foreseeable actions:

- Oxbow Mining, LLC (Elk Creek Mine) is in the process of permitting both an additional 786-acre lease (COC70615) with proposed surface disturbance of approximately 5.63 acres on public lands and a 157-acre coal lease modification (COC61357) with no surface disturbance on the GMUG.
- Mountain Coal Company (West Elk Mine) applied to construct, operate, and reclaim up to 159 E Seam MDWs sites that would support 171 individual MDWs, and use or construction of approximately 26.1 miles of roads within the GMUG are in the final process of approval.
- Oxbow Mining, LLC (Oak Mesa Project – coal exploration license) - a proposal to drill 43 exploration drill holes on private and federal lands into federal subsurface holdings. The entire exploration area covers about 13,873 acres, and temporary surface disturbances from road and pad construction would occur on about 32.86 acres.

- Bowie Resources, LLC (Bowie No. 2 Mine) applied for two lease modifications adjacent to current leases to the north under private and public lands and are in the NEPA analysis. They would add approximately 505 acres, and temporary surface disturbances from road and pad construction would occur on about 16.6 acres.

Additional actions including coal lease modifications and new coal lease applications could be expected in the North Fork Valley. These factors may affect how long mining would continue in this area; however, it is likely that mining would continue for another decade, if not more.

Pending oil and gas activity includes 22 total permits.
- 9 shale well permits;
- 8 coal-bed methane wells; and
- 5 coal mine methane wells.

It is difficult to forecast future oil and gas development within the cumulative impact assessment region. The area is seeing an increase in development which exceeds the past average. Activity increases are due to changes in technology for the drilling and development of the unconventional mancos shale wells and wells used to capture methane from coal mines. It is estimated that the area will average 20 new wells per year (assumes at least 2 wells per pad – 10 new pads per year). This will then create approximately 68 acres of new disturbance per year from oil and gas development.

SG Interests I, Ltd (SG) has proposed a 150 gas well Master Development Plan to develop mineral leases they hold within the Bull Mountain Unit located in Gunnison County, Colorado. SG is proposing to drill and produce 150 wells from approximately 41 individual well pads and associated infrastructure. Approximately 50% of the wells are targeting coalbed methane production and the other 50% will be exploring other potentially productive natural gas zones encountered by drilling into other geologic zones in the area of the Bull Mountain Unit.

August 2012 Oil and Gas lease sale: The BLM has deferred all parcels in the Uncompahgre Field Office that were nominated for the August 2012 lease sale. It is not known which parcels may be leased in the future, or when such leasing would occur.

Other Activities. Other past, present, and reasonably foreseeable development activities within the proposed lease modification areas and vicinity include:
- Historically, fruit orchards along the valley floor and low mesas have been important to the local Paonia economy. More recently, vineyards have replaced some orchards in the area.
- Sheep and cattle are grazed in pastureland around Paonia and also at higher elevations near the mining operations during the summer.
- There are a number of water storage reservoirs and canals around the North Fork Valley to serve agriculture and domestic uses.
- WAPA operates the Curecanti-Rifle 230/345 kV transmission line that parallels Terror Creek.
- Residential developments in the area around the communities of Paonia, Hotchkiss, Crawford, and Delta have been growing in population, with many new houses being built. Most of this development has been down-valley from the coal mines in broader portions of the North Fork Valley. This development has increased the traffic load and demand for maintenance on State Highway 133.

- There is little developed recreation in the area; however, the area is widely used for dispersed recreational activities, such as hunting, four-wheeling, hiking, biking picnicking, horseback riding, snowmobiling, and sight-seeing.

Forest treatments timber sales have been limited in the area.

Cumulatively, impacts from the proposed lease modifications could include small increases in deposition of sediment or pollutants into surface waters, increased subsidence within the North Fork Valley, low increase in cumulative emission of GHGs from mine ventilation, and a slight increase in water withdrawal from the Colorado River system that may potentially impact several federally-listed species of fish in downstream portions of the North Fork and Gunnison Rivers. None of these impacts is expected to be major as analyzed in the specific resource sections. Impacts resulting from the proposed lease modifications could add incrementally to impacts from the other activities discussed above, resulting in a low-level increase in noise, human presence, soil erosion, invasive weeds, wildlife habitat loss, and vegetation loss or conversion. These impacts are discussed in the sections above. Cumulative impacts associated with coal mining are not anticipated to be significant.

Chapter 4 – Consultation and Coordination – Tribes, Individuals, Organizations, Agencies

The following discussion documents the BLM's consultation and coordination efforts during the preparation of this EA. Consultation and coordination is an ongoing effort, and will continue throughout the entire process of developing the final EA.

Native American Tribes

Federally recognized Native American tribes have a unique legal and political relationship with the government of the United States. Executive Order (EO) 13175 requires Federal agencies to coordinate and consult on a government-to-government basis with sovereign Native American tribal governments whose interests may be directly and substantially affected by activities on federally administered lands. Other laws, rules, regulations, policies, standards, and guidelines require consultation with Native American tribes in order to identify cultural values, religious beliefs, traditional practices, and legal rights that could be affected by BLM actions on public lands. These include the National Historic Preservation Act of 1966 (NHPA), the American Indian Religious Freedom Act of 1978 (AIRFA), the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), Department of Interior (DOI) Secretarial Order No. 3215 (DOI 2000), 512 Department Manual Chapter 2 (DOI 1995), BLM Manual H-8160-1, Native American Coordination and Consultation (BLM 1994), and EO 13007, Indian Sacred sites.

Consultation with Native American tribes is also part of the scoping process required by the NEPA, as well as a requirement of the FLPMA. Tribal consultation regarding this EA was conducted by the USFS, GMUG National Forests. The following Native American Tribes were consulted: Ute Mountain Ute Tribe, Southern Ute Tribe and Northern Ute Tribe.

Special Status Species Consultation

Formal consultation with the U.S. Fish and Wildlife Service (USFWS) was conducted by the USFS, GMUG National Forests.

List of Preparers

An ID Team of resource specialists from the BLM prepared this EA as shown in Table 4.0 – List of Preparers below. The ID Team prepared alternatives, collected data for the analysis, assessed potential impacts associated with the alternatives, and prepared the this document.

Table 4.0 - List of Preparers			
Name	**Years of Experience**	**Discipline**	**Education**
BLM, Colorado State Office			
Christina Reed	2	Planning and Environmental Coordinator	JD – Environmental and Natural Resources Law BA – Political Science
Charlie Beecham	26	Chief, Branch of Solid Minerals	BS -- Mining Engineering
Matt McColm	33	Mining Engineer	BS -- Mining Engineering
Chad Meister	6	Air Quality Specialist	BS -- Environmental Science
David Epstein	1	Economist	MS -- Natural Resources Economics

Appendix A, Example Calculations

This technical appendix provides additional information on the procedures used to estimate direct emissions for underground mobile sources. It also includes a summary table listing all estimated emissions for the mine.

1.) Horsepower-hour Calculations for Underground Mobile Sources

To provide acceptable emissions estimates and to fully disclose expected direct emissions from the facilities mobile sources, the EPA's Nonroad model (2008a) was used to generate SCC specific emissions factors (grams per horsepower-hour) for the Delta and Gunnison County based equipment inventories for the year 2000. The year 2000 inventory was chosen to be reasonably conservative, with respect to the fleets overall state of control technology integration that would be expected as the inventory equipment ages and is replaced with newer and better controlled sources. To estimate emissions from the sources, staff had to determine a reasonable thermal efficiency (TE) for the SCC groups in order to estimate the total horsepower-hours the annual fuel use would provide to the equipment. This was necessary because the emissions factors derived from the Nonroad model already account for the overall TE of the equipment, as well as some of the other variables, such as deterioration factors, loading factors, etc. The CO_2 emission factor was used to estimate the TE because the model does not rely on a particular control technology, engine class, or equipment type for derivation, and instead calculates the CO_2 emissions rates based on the in-use brake specific fuel consumption (BSFC - reported as pounds of fuel per horsepower-hour), which is essentially static across all horsepower classes for all model years.

Known Parameters:

1.) MCC annual diesel fuel use 670,000 (500k Under, 170k Surface) gal * source: West Elk Mine
2.) The average density of the diesel fuel is 7.11 lb/gal * source: LSD MSDS
3.) The LHV based energy density of the diesel fuel is 18,500 btu/gal * source: Ave. of literature
4.) Conversion: btu/hp-hr = 2,544.43 * source: Common conversion
5.) CO_2 EF = 642.323 g CO_2/hp-hr * source: EPA Nonroad (2008a)
6.) Carbon content of diesel fuel = 2,778 g C/gal * source: 40 CFR 600.113
7.) CO_2 : C Molecular Weight Ratio = 44/12 = 3.667 (unit-less) * source: Periodic Table

Calculate Parameters (Underground Equipment Example)**:**

1.) Total Available Energy of fuel =
500,000 gal x 7.1 lb/gal x 18,500 btu/lb ..... =
.....65,767.5 MMbtu

2.) Energy Converter to HP (Energy IN) =
65,767,500,000 btu / 2544.43 btu/hp-hr ..... =
.....25,847,605.34 hp-hr

3.) Convert CO_2 EF of Diesel Fuel to C EF =
642.323 g CO_2/hp-hr x 3.667^{-1} .....
.....=175.179 g C/hp-hr

4.) Derived hp-hr/gal of fuel from know Carbon Content of fuel =

2,778 g C/gal / 175.179 g C/hp-hr .....
.....= 15.858 hp-hr/gal

5.) Derived hp-hr from fuel use (Energy Out) =
15.858 hp-hr/gal x 500,000 gal .....
.....=
.....**7,929,026.54 hp-hr**
.....

6.) TE = Energy Out / Energy IN x 100% =
7,929,026.54 hp-hr / 25,847,605.34 hp-hr x 100% .....=**30.68%**

Conclusions:

The Thermal Efficiency of the underground equipment is approximately 30.68% based on the EPA Model data for CO_2. Although low for typical diesel engines based on the literature, it is realistic for working engines where hp is developed at various RMPs (based on loading and work cycles). Further the EPA Model takes this into account when developing the EFs (see Nonroad Technical Document NR009d "Exhaust and Crankcase Emission factors for Nonroad Engine Modeling – Compression- Ignition"). All emissions estimates are based on the EPA Nonroad Model emissions factors and the total hp-hrs derived in calculated parameter 5 for each equipment class, i.e. underground or surface.

2.) Example Emissions Calculations for Mobile Sources

General Equation for all Emissions:

Emissions (tons) = Total hp-hr (Energy Out[1]) x NR EF_E g/hp-hr x 453.6^{-1} g/lb x 2000^{-1} lb/ton

Where:

EF_E = Either the Underground or Surface Equipment Emissions Factor

[1] For N2O, substitute (Energy In). EF based on fuel use only.

A.) For N_2O (surface)

8,788,185.82 hp-hr x 0.005 g/hp-hr x 453.6^{-1} g/lb x 2000^{-1} lb/ton = ...0.048 tons

B.) NO_X (underground)

7,929,026.54 hp-hr x 10.163 g/hp-hr x 453.6^{-1} g/lb x 2000^{-1} lb/ton = ...88.82 tons

Table A1. Direct Criteria and GHG Emissions from Stationary and Mobile Sources in Tons (2011)

Stationary Sources	AIRS ID	PM	PM_{10}	$PM_{2.5}$	NMOG	CO	NO_X	SO_2	CO_2	CH_4	N_2O
Aggregates / Mine Vents / Fugitives (09GU1382)	11, 12, 13, 14 ,15, 16, 19, 20	154.2	88.2	88.2[1]	NA	NA	NA	NA	NA	NA	NA
Diesel Storage Tank (93GU866.XA)	09	NA	NA	NA	1.99[2]	NA	NA	NA	NA	NA	NA
Emergency Generator(s) (10GU1130 & Exempt Units)	21	0.39	0.39	0.39	0.66	5.03	10.34	0.13	1,007.47	0.05	ND
MDW & VAM Exhaust	NA	NA	NA	NA	NA	NA	NA	NA	ND	58,663[4]	NA
Misc. Heating Equipment	NA	4.73	4.30	4.36	2.41	35.70	43.88	0.59	51,920.29	0.97	0.91
Mobile Sources[3]	**SCC**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**NMOG**	**CO**	**NO_X**	**SO_2**	**CO_2**	**CH_4**	**N_2O**
Underground Mining Equipment	2270009000	12.64	12.64	12.26	19.37	74.77	88.82	1.21	5,613.98	0.29	0.14
Surface Mining Equipment	2270002036 2270002051 2270002060 2270002069 2270002033	1.90	1.90	1.84	2.31	12.27	26.24	0.41	1,908.74	0.04	0.05
Total Direct Emissions		173.86	107.43	107.06	26.742	127.77	169.28	2.34	60450.48	58664.35	1.1

[1] All PM10 assumed to be PM2.5, site specific data is not known. APCD permit 09GU1382 does not include PM2.5 limits or emissions.

[2] Emissions based on APEN exemption threshold in attainment area (2.0 tpy).

[3] Mobile sources emissions are for exhaust only.

[4] The CO_2e of the methane gas is approximately 1,231,919 tons.

Table A.2 EPA Nonroad Emissions Factors (g/hp-hr)

Equipment Type	SCC	PM	PM_{10}	$PM_{2.5}$	$NMOG^2$	CO	NO_X	SO_2	CO_2	$CH_4{}^3$	N_2O^4
Underground Mining Equipment	2270009000	1.446	1.446	1.403	2.216	8.555	10.163	0.138	642.323	0.034	0.005
Surface Mining Equipment[1]	2270002036 2270002051 2270002060 2270002069 2270002033	0.535	0.535	0.519	0.652	3.458	7.393	0.116	537.869	0.010	0.005

[1] Emissions factors from listed SCC (Source Classification Code) equipment was averaged together to produce a composite emissions factor to represent likely equipment present at the facility. The individual equipment emissions did not statistically vary significantly, with the exception of the bore/drill rigs, within the model results. However, the drilling and boring equipment is not expected to be as heavily used as the other surface equipment, and therefore a straight average of all the emissions factors was used to develop the composite factor (conservative) vs. a weighted average which would have considered area equipment population data. Data was not available for site fleet data to produce a facility specific weighted average.

[2] NMOG (Non-Methane Organic Gases) used to represent potentially reactive VOC species that may participate in ground level Ozone formation. NMOG is the sum of crankcase and exhaust emissions.

[3] CH4 is represented from TOG (Total Organic Gases) – NMOG. CH4 is the sum of crankcase and exhaust emissions.

[4] N2O factor derived from EPA Climate Leaders GHG Inventory Protocol (EPA430-K-08-004) Direct Emissions from Mobile Combustion Sources, Appendix A, Table A-6. N2O factor reported as 0.08 g/kg of fuel combusted. Factor was converted to g/hp-hr based on calculated hp-hr from total annual fuel use (Appendix A, Example TE Calculation).