



**United States Department of the Interior  
Bureau of Land Management**



**United States Department of Agriculture  
U.S. Forest Service**



---

**Environmental Assessment  
DOI-BLM-CO-S050-2013-0010 EA**

---

**September 2013**

**Spruce Stomp Coal Lease by Application**

---

**BLM Uncompahgre Field Office  
2465 South Townsend Avenue  
Montrose, CO 81401  
Phone: (970) 240-5300**

**Grand Mesa, Uncompahgre, and Gunnison National Forests  
2250 Highway 50  
Delta, CO 81416  
Phone (970) 874-6600**

## Table of Contents

Background / Introduction .....	1
Leasing Process, Authorizing Acts and Relevant Policies, Plans and Programs .....	4
Decision Framework .....	6
Purpose and Need for the Proposed Action .....	7
Proposed Action and Alternatives.....	7
Proposed Action .....	7
No Action Alternative .....	11
Alternatives Considered but Eliminated from Detailed Analysis.....	12
Public Involvement .....	16
Scoping and Identified Issues .....	16
Public Review of Preliminary EA .....	18
Plan Conformance Review .....	21
Other Related NEPA Documents: .....	22
Standards for Public Land Health.....	22
Affected Environment, Environmental Consequences, and Stipulations .....	24
Air Quality and Climate .....	25
Wild and Scenic Rivers .....	46
Geology and Minerals .....	50
Cultural Resources.....	55
Native American Religious Concerns .....	56
Soils .....	57
Vegetation.....	63
Invasive, Non-Native Species.....	65
Threatened, Endangered, and Sensitive Species.....	67
Migratory and Other Birds of Conservation Concern .....	85
Wildlife, Terrestrial .....	89
Wildlife, Aquatic .....	91
Wetlands and Riparian Areas .....	92
Floodplains .....	93
Water Quality, Surface and Ground .....	93
Wastes, Hazardous or Solid.....	100
Environmental Justice .....	101
Access and Transportation .....	101
Realty Authorizations .....	105
Range Management .....	106
Wildfire .....	109
Hydrology/Water Rights .....	109
Noise.....	112
Recreation.....	113
Visual Resource Management.....	114
Paleontology .....	117
Socioeconomics .....	118
Cumulative Impacts .....	121
Persons / Agencies Consulted.....	125
Interdisciplinary Review .....	126
List of Acronyms and Abbreviations .....	127
References.....	130

## List of Maps

Map 1	General Location Map .....	2
Map 2	Detailed Location Map .....	3
Map 3	Spruce Stomp Coal Lease Application in Relation to Federal Class I Airsheds and other Regional PSD Class I.....	32
Map 4	Soil Mapping Units in the LBA Tract.....	58

## List of Figures

Figure 1	Typical Methane Pump .....	10
Figure 2	Subsidence Alternatives Considered but Eliminated.....	13
Figure 3	West Fork Terror Creek WSR Eligible Study Corridor.....	47

## List of Tables

Table 1	Reasonably Foreseeable Surface Use Estimated for the Proposed Action .....	9
Table 2	Standards for Public Land Health.....	23
Table 3	Environmental Assessment Resource Areas.....	25
Table 4	Ambient Air Quality Standards .....	27
Table 5	Estimated Direct Criteria and GHG Emissions from Stationary and Mobile Sources .....	35
Table 6	Delta and Gunnison County Emissions Inventory (CDPHE, 2008).....	38
Table 7	Mesa County Emissions Inventory (tons), Total Emissions (CDPHE, 2008) .....	38
Table 8	Western County Gaseous, Particulate, and Meteorological Monitors in Operation for 2010.....	39
Table 9	Western County Monitored Particulate Matter Values for NAAQS (2010).....	40
Table 10	County Monitoring Data (2012) .....	40
Table 11	Stratigraphy of the LBA Tract .....	51
Table 12	Anticipated Subsidence Values within the LBA Tract .....	53
Table 13	Summary of Soil Resources within the LBA Tract .....	59
Table 14	Vegetative Cover-types Present within Proposed LBA Tract.....	64
Table 15	Invasive Plant Species Identified in the General Project Area .....	66
Table 16	Federally Threatened, Endangered, or Candidate Species in Delta County .....	68
Table 17	BLM and USFS Sensitive Species that May Be Present in or near the LBA Tract.....	70
Table 18	Birds of Conservation Concern within BCR 16.....	86
Table 19	Water Rights Associated with the Proposed Action .....	110
Table 20	Population Characteristics, Delta County and the State of Colorado .....	118
Table 21	Raw Coal Production – North Fork Valley – BLM UFO .....	122

## List of Appendices

Appendix A	Coal Unsuitability Criteria
Appendix B	Tract Delineation Report
Appendix C	Lease Stipulations
Appendix D	Example Calculations
Appendix E	Informal Section 7 Consultation for Bowie Resources Underground Coal Mining Associated Surface Activities and Facilities
Appendix F	Evaluation of Potential Subsidence Impacts of Longwall Mining in the Spruce Stomp Lease Area to Aquatic Life and Water Supply

# ENVIRONMENTAL ASSESSMENT

NUMBER: DOI-BLM-CO-SO50-2013-0010

CASEFILE/PROJECT NUMBER: COC-75916

PROJECT NAME: Spruce Stomp LBA

LEGAL DESCRIPTION:

COC-75916

Township 12 South, Range 91 West, 6<sup>th</sup> P. M  
Section 31: Lots 11 through 26 inclusive  
Section 32: Lots 10 through 15 inclusive

Township 12 South, Range 92 West, 6<sup>th</sup> P.M.  
Section 36: S2

Township 13 South, Range 92 West, 6th P.M.  
Section 1: Lots 5 through 8 inclusive

Township 13 South, Range 91 West, 6th P.M.  
Section 5: Lots 2, 3, 4, 10, & 11, W/2W/2NENE, NWNE, NESWNE,  
SESWNE,N/2NWSWNE, N/2NW,N/2N/2SENE, E/2NW/SE, W/2W/2NESE,  
N/2NENESE, NENWNESE;  
Section 6: Lots 1 through 4 inclusive

\*containing 1,789.2 acres more or less

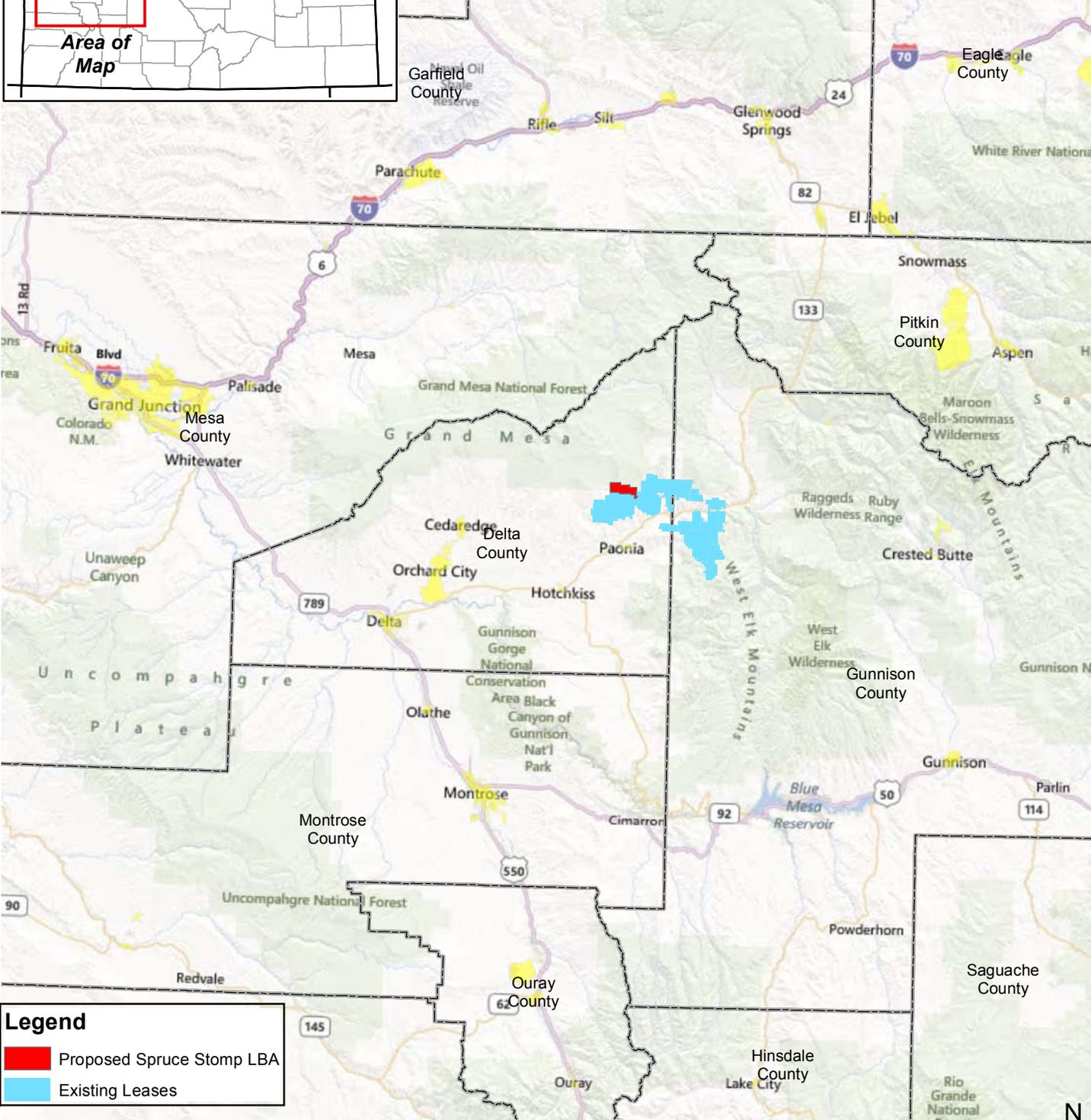
APPLICANT: Bowie Resources, LLC

## BACKGROUND / INTRODUCTION

Bowie Resources, LLC (Bowie) submitted a federal competitive coal lease-by-application (LBA) to the Bureau of Land Management (BLM) on October 12, 2012. The proposed LBA contains lands managed by the BLM Uncompahgre Field Office (UFO) and the U.S. Forest Service (USFS or Forest Service) Grand Mesa, Uncompahgre, and Gunnison National Forests (GMUG), as well as private lands. The LBA (COC-75916), called Spruce Stomp, contains approximately 1,789.2 acres and is immediately adjacent to existing coal leases held by Bowie. The proposed lease covers approximately 1,332.6 acres of National Forest System (NFS) land, 88.4 acres of BLM land and 368.2 acres of private surface with federal minerals (see Maps 1 and 2). The application area contains an estimated 8.02 million tons of recoverable coal. All of the coal mineral estate is administered by the BLM. The BLM is required by law to consider leasing federal coal for economic recovery.

# Map 1

General Location of the  
Spruce Stomp Coal Lease by Application  
Serial No. COC-756916



**Legend**

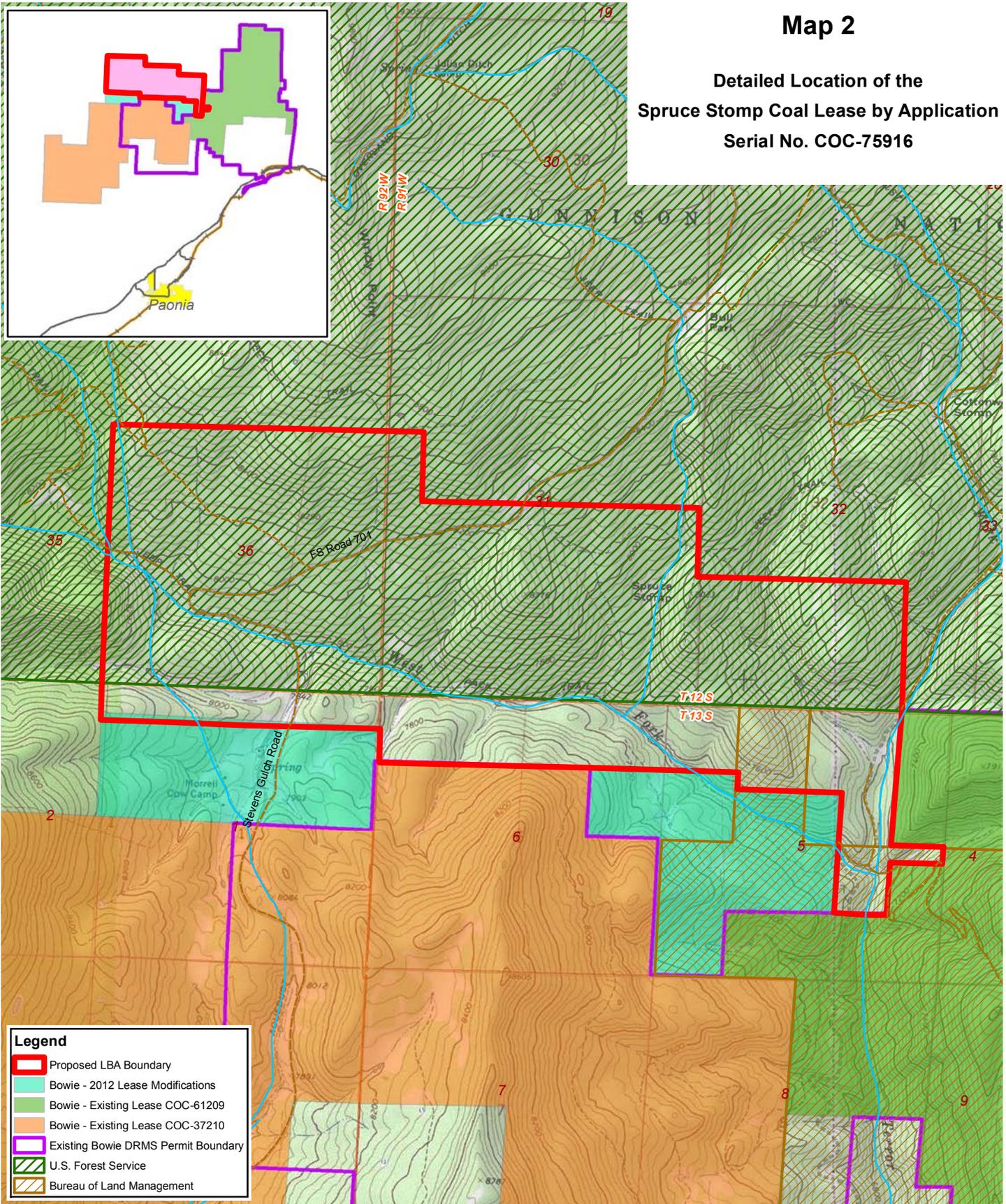
- Proposed Spruce Stomp LBA
- Existing Leases

No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM



## Map 2

Detailed Location of the  
Spruce Stomp Coal Lease by Application  
Serial No. COC-75916



No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM



With respect to lands managed by the Forest Service, the agency is considering consenting to the BLM for leasing the portion of COC-75916 under its jurisdiction (1, 332.6 acres) and prescribing conditions (as stipulations) for the protection of non-mineral (surface) resources. If Forest Service consent is given, the BLM, after considering the application and lands under its jurisdiction, will decide whether or not to offer the coal lease by competitive bid and will attach the stipulations necessary to protect non-mineral (surface) resources as prescribed by the surface management agency,

Coal mining has been conducted in the North Fork Valley for more than 100 years. Coal mined in the North Fork Valley, is a high British Thermal Unit (BTU), low sulfur coal. Its use in industry helps meet standards of the Clean Air Act. As such, there is a demand for coal from mines in the North Fork Valley for electric power generation.

Currently, Bowie operates the Bowie No. 2 Mine which is an underground longwall coal mine located about 5 miles northeast of Paonia in Delta County, Colorado (see Map 2). Bowie applied for the coal lease, which is immediately adjacent to their existing federal coal leases at the Bowie No. 2 Mine, with the intention to extend their existing mine and produce additional compliant and super-compliant coal, although they may not be the successful bidder on this LBA. The Bowie No. 2 Mine has been in operation since November 1997 and is capable of producing approximately 5,000,000 tons of coal annually. Bowie holds approximately 11,729.93 federal lease acres and approximately 1,696 acres of fee coal (total 13,425.93 acres). The combined State of Colorado, Division of Reclamation Mining and Safety (DRMS) permits for the Bowie No. 1 and No. 2 mines cover approximately 14,234.4 acres, and the coal is accessed by the Bowie No. 2 Mine.

## **LEASING PROCESS, AUTHORIZING ACTS AND RELEVANT POLICIES, PLANS AND PROGRAMS**

This environmental assessment (EA) is prepared to inform federal agency decision makers; publicly disclose the probable environmental impacts of coal leasing and future development of the coal reserves; and establish protections in the form of lease stipulations for surface resources should the lease be issued.

In order for a mining company to access federal coal reserves, the company must apply to lease the federal lands for development of the coal resource. An application is submitted to the BLM, which administers the federal mineral estate on all federal lands. BLM initiates the lease consideration process, which ensures compliance with the National Environmental Policy Act (NEPA) is completed.

The BLM, charged with administration of the mineral estate on these federal lands, is required by law to consider leasing federally-owned minerals for economic recovery. Federal mineral leasing follows the Mineral Leasing Act of 1920 (MLA), as amended by the Federal Coal Leasing Amendments Act of 1976 (FCLAA), and specific procedures for this project are set forth in 43 CFR 3425. BLM directives indicate the need to offer federal coal in quantities responsive to market conditions and assure maximum economic recovery of mineable federal coal reserves. The BLM has the mineral leasing authority, and the Forest Service is the Surface Managing Agency for lands under their authority within the Spruce Stomp LBA tract. The

leasing and subsequent production of these federally administered coal reserves ensures that they would not be bypassed or rendered inaccessible.

Although the decision to lease these lands is a necessary requisite for mining, that decision is not the enabling action that will allow mining. On-going management of the existing leases, as well as any potential permitting of mining and surface activities associated with this LBA follows the Surface Mining Control and Reclamation Act of 1977 (SMCRA) implementing regulations at 43 CFR 3400 and 30 CFR 700 (respectively) and the State of Colorado Coal regulations. These permitting actions fall within the purview of the DRMS under procedures set forth in 30 CFR 700, et. seq. and the regulations of the Colorado Mined Land Reclamation Board for Coal Mining (CRS 34-33-101).

In order to conduct mine operations on new leases, federal coal lease holders in Colorado must submit a permit revision application to DRMS for proposed expansions of existing mines that covers mining and reclamation on federal lands. DRMS reviews the package to ensure that the permit application complies with the permitting requirements and that the coal mining operation would meet the State's performance standards. The Office of Surface Mining Reclamation and Enforcement (OSM), BLM, and other federal agencies also review the application to ensure it contains the necessary information for compliance with the coal lease, the MLA, NEPA, and other applicable federal laws and regulations. If the application complies, DRMS issues a permit to conduct coal mining operations. When needed, the OSM recommends approval, approval with conditions, or disapproval of the mining plan to the Assistant Secretary of the Interior, Land and Minerals Management. Prior to mining plan approval, OSM obtains input from the BLM (for the mineral estate) and the Forest Service for NFS lands. The OSM and DRMS are cooperating agencies on this EA as they are responsible for the reviewing of mining plans and overseeing the subsequent permitting process.

The Forest Service administers its mineral program (Forest Service Manual 2800 ZERO Code – WO Amendment 2800-91-1 Page 3) to:

1. Encourage and facilitate the orderly exploration, development, and production of mineral and energy resources within the NFS in order to maintain a viable, healthy minerals industry and to promote self-sufficiency in those mineral and energy resources necessary for economic growth and national defense;
2. Ensure that exploration, development and production of mineral resources are conducted in an environmentally sound manner and that these activities are considered fully in the planning and management of other NFS resources; and
3. Ensure that lands disturbed by mineral and energy activities are reclaimed for other productive uses.

The GMUG considers mineral exploration and development to be consistent with its Forest Plan (GMUG Amended Forest Plan, Page II- 61). It cooperates with the U.S. Department of the Interior (USDI), the BLM, in administering lawful development of leasable minerals. Under the federal leasing program, the USDI combined major federal coal management responsibilities into one unified program in order to:

1. Give the nation a greater assurance of being able to meet its national energy objective;
2. Provide a means to promote a more desirable pattern of coal development with ample environmental protection;
3. Assure that state and local governments participate in decisions about where and when federal coal production will take place; and
4. Increase competition in the western coal industry.

Following direction from the Mining and Mineral Policy Act of 1970 and the Federal Land Policy and Management Act (FLPMA) of 1976, the responsible federal agencies must generally ensure the following:

1. Adverse environmental impacts on public land surface resources are minimized to the extent practical;
2. Measures must be included to provide for reclamation, where practicable; and
3. The proposed operation will comply with other federal and state laws and regulations.

## **DECISION FRAMEWORK**

**Forest Service.** The GMUG Forest Supervisor is the Authorized Officer for this discretionary consent decision on the LBA (FSM 2822.04c, R2 Supplement; 43 CFR 3420.4-2). Given the purpose and need, the Authorized Officer will review the Proposed Action, the other alternatives, and the environmental consequences in order to decide the following:

- Whether or not to consent to the BLM issuing Federal Coal Lease COC-75916 according to the MLA of 1920; as amended by the FCLAA of 1976;
- If the Forest Service consents to issue the lease, it will prescribe stipulations needed for the protection of non-mineral resources on NFS lands.

The Forest Service Authorized Officer will determine if the activity is consistent with the GMUG Forest Plan. The Forest Service decision will be made based on the analysis relative to the No Action and Proposed Action alternatives. In addition, the FS as the Surface Management Agency reviews the land in the application and reviews the Unsuitability Criteria<sup>1</sup> under 43 CFR 3461, and makes a recommendation to the Secretary of Interior who determines whether there are no significant recreational, timber, economic, or other values which may be incompatible with the lease (43 CFR 3461.5(2)(i)).

**BLM.** The BLM State Director is the Authorized Officer for the BLM and will decide whether or not to conduct a competitive sale for the coal lease under the MLA of 1920, as amended, and the federal regulations under 43 CFR 3400. The UFO Manager/Southwest District Manager is responsible for providing the State Director with briefings and recommendations. Specifically, the BLM will decide whether to:

- Adopt the No-Action Alternative (no leasing);

---

<sup>1</sup> The Surface Mining Control and Reclamation Act of 1977 (SMCRA) principally regulates coal mine permitting actions (see Section 1.6). To the extent SMCRA applies at the coal leasing stage, it is the basis for the Unsuitability Assessment codified in BLM regulations at 43 CFR 3461 that is applicable at the leasing stage.

- Adopt the coal lease as applied for by the applicant;
- Adopt the coal lease as amended by the BLM.

In addition, for lands administered by the FS, based on recommendation the Secretary of Interior (represented by the BLM State Director) makes the determination on whether there are no significant recreation, timber, economic, or other values which may be incompatible with leasing the lands in question, and whether or not to modify the leases. The BLM cannot issue a coal lease without the consent of the surface managing agency (in this case the Forest Service).

**OSM.** The OSM is a cooperating agency in preparing this EA. If the lease is issued, they will determine if there is a need for a federal mining plan modification at the time the actual permitting process is underway. If a federal mining plan modification is needed, the OSM will be responsible to recommend that the USDI Assistant Secretary for Lands and Minerals approve, approve with conditions, or not approve the modification under 30 CFR 746.

**DRMS.** The DRMS is a cooperating agency in preparing this EA. In Colorado, DRMS operates under an OSM-approved program with primary responsibility for administering coal mining operations in the state, as codified by the Colorado Surface Coal Mining Reclamation Act (CRS 34-33-101) and attendant regulations which are consistent with the overarching federal regulations (30 CFR 906). Any applications submitted to the State of Colorado to revise the state mining and reclamation permit, including applications to allow mining and its related surface disturbances, reclamation, and the expansion of the approved mine permit boundary to include the lease area, would be reviewed by the DRMS.

## **PURPOSE AND NEED FOR THE PROPOSED ACTION**

The BLM and the USFS have identified a need to respond to a federal coal lease application in accordance with the MLA of 1920, as amended by the FCLAA of 1976, and the FLPMA of 1976, and implementing regulations at 43 CFR 3400.

The purpose is for the BLM to decide whether or not to offer the Spruce Stomp LBA tract for competitive leasing (with appropriate stipulations) under the MLA, as amended and federal regulations under 43 CFR 3400. The purpose is also for the Forest Service to decide whether to consent to the BLM offering the NFS lands within the tract for lease and what conditions must be prescribed for protection of non-coal resources.

## **PROPOSED ACTION AND ALTERNATIVES**

### **Proposed Action**

The Proposed Action is for the Forest Service to consent to the BLM to lease the NFS lands with conditions for use and protection of non-mineral interests. The Proposed Action is also for the BLM to issue a federal coal lease (COC-75916) for the Spruce Stomp LBA tract (approximately 1,789.2 acres), which would be for underground development and production of federal coal reserves, in accordance with applicable laws and regulations, including terms and conditions for protecting non-mineral resources.

Application of the Unsuitability Criteria for Coal Mining (see Appendix A) described in 43 CFR 3461 did not identify any lands in the tract as being “unsuitable.” Some restrictions were identified for some of the criteria. These restrictions would be carried forward as stipulations on the coal lease. The BLM has prepared a Tract Delineation Report, which is provided as Appendix B.

**Reasonably Foreseeable Mine Operations Plan.** To analyze potential surface impacts such as underground mine subsidence, this EA assumes a Reasonably Foreseeable Mine Plan (RFMP) for this leasing decision. The Spruce Stomp LBA contains an estimated 8.02 million tons of federal coal reserves in the lower-B seam. While other coal is present in the LBA tract, the BLM Tract Delineation Report (see Appendix B) does not consider the other seams as economically mineable given a variety of reasons. It is assumed that the coal would be recovered using the longwall method of underground coal mining. The tract is bounded on the south by currently leased federal coal and on the east by unmineable (thin) coal (unleased). Therefore, it is assumed that access to the coal reserves in the Spruce Stomp LBA tract would most easily be achieved from the existing underground workings at the Bowie No. 2 Mine with existing surface facilities. Understanding that federal coal is leased through a competitive bid process, the analysis assumes that a company other than Bowie may be the successful bidder at the lease sale. The coal does not outcrop on the Spruce Stomp LBA tract; therefore, no new portals could be located, and there may not be a reasonable shaft location.

It is assumed that the coal would be transported to market using the existing coal handling facilities and existing spur rail line.

The RFMP for the Spruce Stomp tract assumes that coal in the lower-B Seam would be extracted from longwall panels trending northwest southeast. The foreseeable mine operations plan in the Spruce Stomp LBA tract is a northward expansion with new longwall panels planned from the existing lease to the south. Continuous mine development would be used to drive development entries for the longwall panels, with the primary coal production being achieved using the longwall method and equipment.

The tract represents about 16 to 18 months of coal reserves based on the rate of mining currently employed at the Bowie No. 2 Mine. The lower-B Seam coal in the tract would be mined from about 2015 to 2019. Some variations to these timeframes may occur based on permitting, unforeseen mining or geologic circumstances, coal contract variability, etc.

The RFMP assumes a longwall panel configuration that would mine under West Terror Creek. The RFMP was used to develop the coal mine subsidence prediction used to assess potential surface resource impacts.

**Reasonably Foreseeable Post-lease Surface Use.** In order to effectively analyze potential post-lease activities on the land surface, the analysis assumes a scenario of potential surface use. It must be noted, however, that decisions pertaining to specific surface use and disturbance are not made at the leasing stage rather they are specifically considered at the post-lease permitting stage. In recent years, coal mines operating in the region have experienced build-up of methane gas in the underground workings after the rock strata have subsided due to mining. Under Mine,

Safety, and Health Administration (MSHA) regulations, mines are required to maintain methane levels at or below certain levels to ensure worker safety underground. Typically in this region, the mine ventilation systems alone cannot effectively keep methane levels at or below the established levels; therefore, methane liberation methods are frequently used.

For the purposes of analysis, it is assumed that a system of methane drainage wells (MDWs) would be needed to assist in liberating methane from the underground mine. These MDWs would be drilled from the land surface to a depth located slightly above the mine workings and use the methane vented to power an exhausting pump to pull methane from the mine. Drilling these MDWs requires construction of drill pads and temporary roads on the land surface. Based upon information provided in the application, acres of potential post-lease surface disturbance were estimated and are shown in Table 1. These features are on the landscape for 1 to 3 years, after which they are decommissioned and the land surface is reclaimed and returned to pre-mining land uses. According to DRMS requirements under SMCRA, typical reclamation includes returning land surface to approximate original contours, replacing the topsoil, and revegetation. Experience in the area has shown that reclamation has been generally successful within 2 to 5 years after reclamation work is completed.

**Table 1**  
**Reasonably Foreseeable Surface Use Estimated for the Proposed Action**

<b>Component</b>	<b>Quantity</b>	<b>Acres</b>
Methane drainage wells	35 <sup>1</sup>	25
Temporary roads for MDWs	4 miles	20
<b>Total</b>	<b>--</b>	<b>45</b>
<sup>1</sup> It is assumed that 10 of the 35 MDWs would be directionally drilled from the 25 estimated pads.		

MDWs are drilled during the construction season before the longwall panel they are located within is to be mined. The set of MDWs within a panel are drilled at approximately the same time over a period of several weeks. A methane pump is installed at each MDW. The methane pump requires weekly inspection and maintenance while in operation. Methane pump operations commence after the longwall has mined past the MDW and cease when the longwall panel has been mined out. Figure 1 provides a photo of a typical methane pump.

For the purposes of the effects analyses in this EA, it is assumed that surface disturbance would occur periodically over the life of the lease. The majority of the lease disturbance is expected to occur within 2 to 4 years of lease issuance; however, it could be about 25 years from lease issuance to lease relinquishment and final bond release. Exact locations of anticipated disturbance cannot be identified at the leasing stage, due to the competitive nature of coal leasing and because a final mine operations plan has not been approved. It is assumed that 35 MDWs would be needed over the life of the lease. It is also assumed that 25 well pads would be needed for the 35 wells; 10 of the MDWs could be completed using directional drilling from pads containing two MDWs. Each pad would require one acre of disturbance. Associated temporary access road acres assume a 30-foot average disturbance width with a 14-foot running surface.

It is highly unlikely that all 35 MDWs would be constructed and/or venting at the same time. Similar to what has been seen in other North Fork mine operations, it is estimated that 6 to 8

MDWs would be in operation at any given time and life of an MDW varies from 1 to 3 years depending on placement in the panel. Typically, in a given summer, the MDWs for the next year's operations are drilled, and the MDWs from the panel mined 2 years previous are reclaimed. However, because the mine plan is not yet known, the exact number of wells that would be operational, constructed, or reclaimed each year is unknown.

It is common practice, and therefore assumed that if any exploration drilling, staging areas, and groundwater monitoring drill pads and access road construction are needed, they would utilize the same locations as those used for MDWs. Therefore, no additional surface use beyond that assumed above for MDWs is analyzed in this document.

Other post-leasing surface disturbance that could be reasonably anticipated includes, but is not limited to, exploration drilling, groundwater monitor well installation, water handling facilities, subsidence and hydrology monitoring facilities, and associated access roads.



**Figure 1**  
**Typical Methane Pump**

Subsidence and hydrology monitoring may require placement of monitoring devices on the land surface. These may include small subsidence monuments, survey markers, stream gauges, flumes, etc. Access to the facilities would require motorized vehicles that would use the system of existing roads. At the leasing stage, it is not possible to locate site-specific areas where potential post-lease surface uses may occur because the ultimate lease and subsequent mine plan have not yet been approved; therefore, surface use and disturbance cumulative effects are estimations and will be used to aid the impact analysis discussed in each resource section. If

surface uses are proposed during the life of the lease (if it is issued), then the site-specific proposals would be evaluated during subsequent permitting processes through the DRMS and/or the OSM based on surface use stipulations on the lease.

MDW abandonment would follow USFS, BLM, and state guidelines. Holes would be sealed using cement or other approved sealant from the bottom of the hole to within 3 feet of the surface. Drill cuttings may be mixed with the sealant. The surface casing would be cut off below the ground surface. That portion of the hole between the seal and the reclaimed ground surface would be filled with dirt, drill cuttings, or both to minimize hazards to animals or humans. Hole locations would be marked with a 4-foot (minimum) steel roof bolt, brass survey cap, or a T-shaped fence post.

Mining on the existing leases and proposed lease tract would be short term, lasting approximately 3 to 4 years. Due to the economic limitations of this short-term operation, the Proposed Action would include venting methane gas directly into the atmosphere via MDWs and the mine ventilation system (see section below, Alternatives Considered but Eliminated from Detailed Analysis).

### **Design Features of the Proposed Action**

The Proposed Action includes conditions for protection of non-coal resources in the form of lease stipulations derived from restrictions developed from application of the Coal Unsuitability Criteria from 43 CFR 3461 (see Appendix A), the Forest Plan, previous related environmental analyses, policy, and law. These are listed in each respective resource section and are summarized in Appendix C.

In accordance with Forest Service Manual (FSM) 2820, the Standard Notice for Lands under the Jurisdiction of Agriculture would apply to the LBA. This Standard Notice includes requirements for Cultural and Paleontological Resources, and Threatened and Endangered Species. Further, the Standard Notice contains the following language: “The permittee/lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of Interior in the permit. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of an exploration plan by the Secretary of the Interior, (2) uses of all existing improvements, such as forest development roads, within and outside the area permitted by the Secretary of the Interior, and (3) use and occupancy of the NFS not authorized by the permit/operation approved by the Secretary of the Interior.”

### **No Action Alternative**

In accordance with NEPA and the Council on Environmental Quality (CEQ) regulations, which require that a No Action Alternative be presented in all environmental analyses in order to serve as a “baseline” or “benchmark” from which to compare all proposed “action” alternatives, this EA analyzes a No Action Alternative.

Under the No Action Alternative, the coal lease would not be approved. As a result, federal coal reserves within the applied for tract would not be recovered and would, therefore, be bypassed.

### **Alternatives Considered but Eliminated from Detailed Analysis**

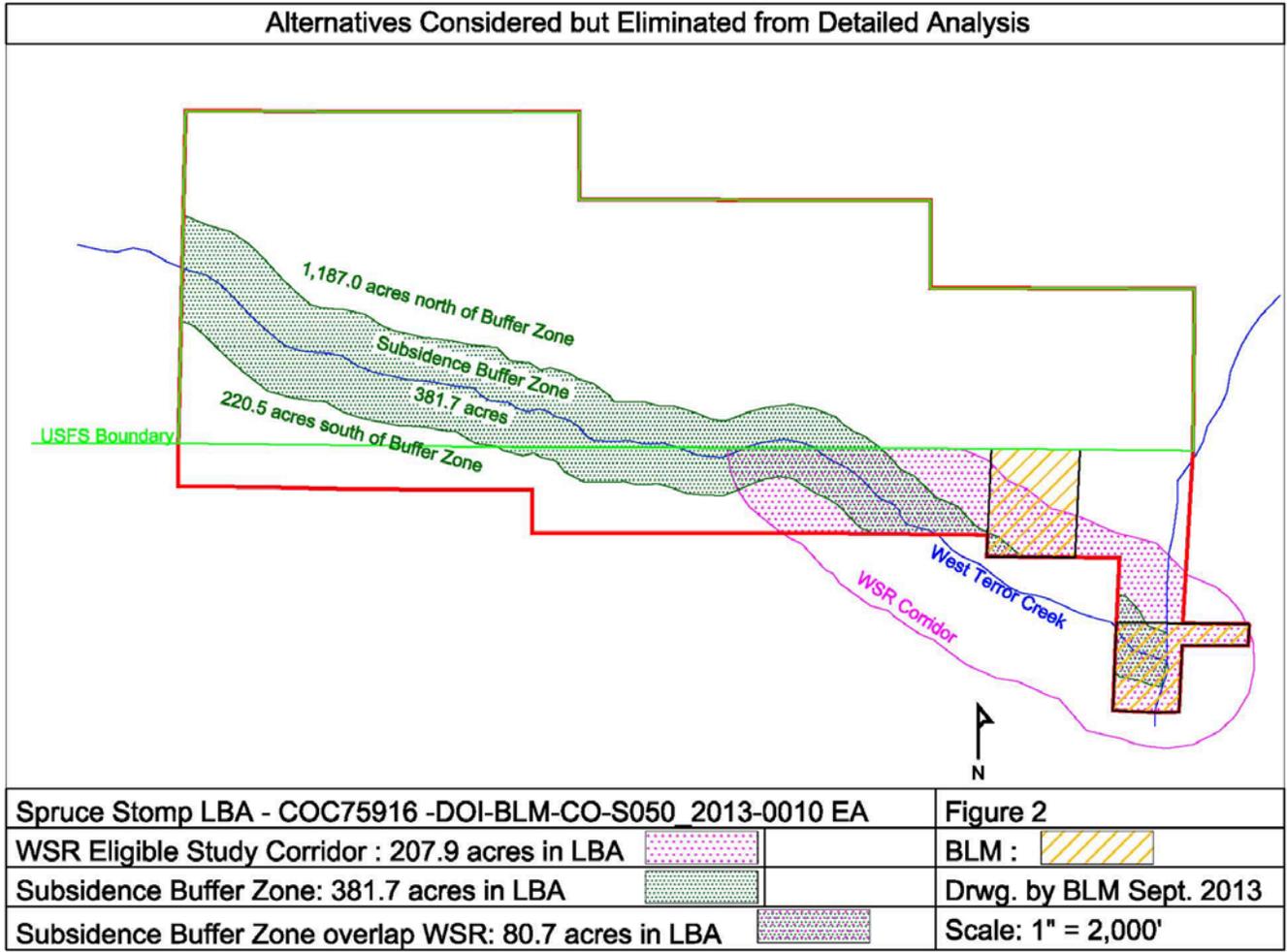
If an alternative is considered during the environmental analysis process, but the agency decides not to analyze the alternative in detail, the agency must identify those alternatives and briefly explain why they were eliminated from detailed analysis (40 CFR 1502.14). An alternative may be eliminated from detailed analysis if:

- it is ineffective (does not respond to 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 inconsistent with the basic policy objectives for the management of the area [such as, not in conformance with the Resource Management Plan (RMP)];
- its implementation is remote or speculative;
- 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.

Alternatives specific to this EA that were considered, but that will not be analyzed in detail, are discussed below.

### **Subsidence**

Two alternatives were suggested verbally to the agencies by Terror Ditch and Reservoir Company (TDRC) to analyze subsidence for the West Terror Creek drainage by either controlling or preventing subsidence to provide protection for the drainage. Regardless of the protection provided, both alternatives would result in a subsidence protection (or buffer) zone that would be determined using an angle of draw (i.e., angle between a vertical line drawn upward to the surface from the edge of the underground opening and a line drawn from the edge of the opening to the point of zero surface subsidence). The subsidence buffer zone is depicted in Figure 2.



**Figure 2 Subsidence Alternatives Considered but Eliminated**

The following are common to both alternatives:

1. The buffer zone estimated angle of draw is conservatively estimated to be 25 degrees (North Fork Coal EIS USFS and BLM, 2000).
2. The result would be a winding corridor defining the buffer zone that would get wider in the higher elevations of the drainage and comprise 381.7 acres.
3. The buffer zone would run roughly west-northwest across the tract and break the tract into three portions with the buffer zone in the middle, a 1,187.0-acre northern section, and a 220.5-acre southern section.
4. The buffer zone would overlap the ½ mile wide Wild and Scenic River study corridor established on BLM and private surface/federal minerals on 80.7 acres of the LBA. The buffer zone would not supersede the Wild and Scenic River study corridor.
5. The buffer zone would result in avoiding surface impacts in the drainage.
6. The buffer zone would run counter to the report on surface impacts that concluded that neither adverse impacts to aquatic life nor the wetted perimeter of West Terror Creek would be expected as a result of potential subsidence within the LBA tract (Wright Water Engineers - WWE, 2013a).
7. Neither alternative would be carried forward for detailed analysis because they are ineffective and do not respond to the purpose and need for the Proposed Action.

**Control Subsidence in West Terror Creek Alternative.** This alternative would allow development mining only (i.e., support pillars left in place) in the buffer zone. There would be reduced coal recovery within the buffer zone and its sinuous shape would interfere with a mine layout that would otherwise be more efficient for the LBA tract. As a result coal recovery in the LBA would be reduced by about 50 percent from an estimated 8.02 to 4.00 million tons.

**Prevent Subsidence in West Terror Creek Alternative.** This alternative would deny any type of mining in the buffer zone. The buffer zone itself and the portion of the proposed tract north of the buffer zone would be completely inaccessible, thereby making them both unmineable. The proposed tract would be rejected and the BLM would delineate a tract to contain only mineable coal south of the buffer zone which would be approximately 220.5 acres or 12.3 percent of the proposed tract and represent about 87 percent less recoverable coal reserves. That tract would not likely support any competitive bonus bid.

### **Coal Mine Methane (CMM) and Gob Vent Gas (GVG) Capture**

An alternative analyzing the capture of CMM from the mine ventilation system and GVG released from the MDW was considered; however, the alternative was not carried through the entire analysis process. The alternative was eliminated from detailed analysis due to the anticipated environmental impacts associated with methane capture [i.e., new pipelines to each well site, improved roads to service the MDWs, power lines to a variety of facilities (wells, compressors, etc.)] as well as the cost associated with the infrastructure required.

In December 2012, Bowie provided the BLM with a report (Vessels Coal Gas Inc., 2012) evaluating the technical and economic feasibility to capture CMM and GVG within the lease area. Vessels Coal Gas, Inc. (VCG) evaluated the technical capability and potential for uses of methane recovered from the Bowie No. 2 Mine. VCG is a Denver based company, developing

and operating coal mine methane producing properties in the Rocky Mountain and Appalachian coal basins.

Separately, VCG has performed numerous evaluations for gathering methane from various coal mine sources in the Paonia to Somerset corridor along the North Fork of the Gunnison River. In general, those evaluations have indicated a need for volumes on the order of 10,000,000 cubic feet per day of methane to justify the costs for gas treating and pipeline facilities that would be required to access commercial natural gas markets. The volumes of gas available from the GVG at the Bowie No. 2 Mine are less than 1,000,000 cubic feet per day of methane. VCG has recently completed construction of an electric generation and enclosed flare project, utilizing methane emissions from the nearby Elk Creek Coal Mine operated by Oxbow Mining. The economics of this project were supported by a successful negotiation of a favorable electric power purchase agreement with Holy Cross Energy and a carbon offset contract for enclosed flare destruction with Xcel Energy, each of which was negotiated before the recent fall in carbon offset prices. Carbon offset prices from an enclosed flare project are not likely to improve as readily as carbon offsets from a beneficial use project such as electricity generation might.

The report notes that the Climate Action Reserve has placed a higher ranking within its development of carbon reduction protocols on beneficial use as opposed to methane destruction projects. VCG concluded that the current conditions at the Bowie No. 2 Mine make current methane capture technologies economically unfeasible. Methane released to the atmosphere from the Bowie No. 2 Mine activity has two principal avenues:

- High volume circulation of ventilation air through the underground mining access corridors that is subsequently exhausted to atmosphere; and
- MDWs drilled from the surface to locations immediately above the longwall panels that are used to remove methane released during the mining of longwall panels for the safety of the mine workers.

As indicated in the VCG report, the geographic location of the proposed new longwall panels would be too far from the existing Bowie surface facilities to provide ready access to facilities for GVG to be made available for either electric or natural gas markets or to utilize process heat loads.

While the BLM does not analyze methane capture in the alternatives carried forward in this EA, nothing in this document would prevent any lessee, if the lease is issued, from voluntarily implementing a methane capture project in the future if it is determined to be feasible and all needed permits and authorizations are acquired.

### **Reduce Potential Greenhouse Gas Emissions through Methane Flaring**

An alternative analyzing the flaring of CMM was also considered and eliminated from detailed analysis. Any proposed flaring system intended for use at a coal mine in the United States would need to be approved by MSHA. MSHA has a process in place to analyze the safety aspects of a proposed design and would conduct a thorough review of the proposed flaring system in order to establish the requirements for the system. It is not likely that a thorough review and approval

would occur prior to the development and operation of the mine expansion. To date, MSHA has not approved a flaring system for a coal mine in the Western U.S. MSHA has authorized a flaring system for Solvay's underground trona mine near Green River, Wyoming. This degasification system was commissioned in August 2010 and is currently in operation. Trona mines have similar characteristics to underground coal mines in terms of their methane gas production and mining techniques. However, trona is a non-combustible ore, while coal is highly combustible. Because of the combustibility of coal, and associated concerns for miner safety, the flaring system in use at Solvay cannot be considered for an underground coal mine.

Additionally, flaring of methane can result in the release of other air pollutants, including NO<sub>2</sub> and carbon monoxide (CO), which are criteria pollutants. The following was considered in relation to methane flaring:

- As indicated in the VCG report, to reduce methane emissions from the GVG, conventional flaring technology could be used to destroy the methane.
  - Production of methane for flaring would occur approximately 80 percent of the time for 5 to 6 months. Exhibit C to the VCG report provides a summary of MDW flow and methane concentration data.
  - Absent a significant increase in both a) market valuations of carbon offsets from capture of methane associated with coal mining and b) the levels of methane emissions from the Bowie No. 2 Mine, economic returns are far below that necessary to provide any reasonable incentive to a carbon project developer to consider investing in facilities to capture the methane emissions associated with the currently proposed Bowie No. 2 Mine operating plan.

While the USFS and BLM did not analyze methane flaring in the alternatives carried forward in this EA, nothing in this document prevents any lessee, if the lease is issued, from voluntarily implementing a methane flaring project in the future if it is determined to be feasible and all needed permits are acquired.

## **Public Involvement**

### **SCOPING AND IDENTIFIED ISSUES**

As part of the public involvement process, letters were mailed to more than 700 interested parties (i.e., private landowners, government agencies, businesses, and advocacy groups) and a public notice/legal ad outlining the Proposed Action as well as the BLM's and the USFS' intent to prepare an EA analyzing the application was published. The legal ad was published in the Delta County Independent and the Grand Junction Daily Sentinel, newspapers of record for the agencies. The proposal and a map were posted to the BLM UFO website at <http://www.blm.gov/co/st/en/fo/ufo.html> and the USFS website at <http://www.fs.usda.gov/goto/sprucestomp>. The BLM and the USFS invited the public to provide comments on the proposal for 30 days beginning January 16, 2013 and ending 30 days following the date of publication of the legal notice (ended February 22, 2013).

During the comment period, 20 comment letters were received, including 1 from Colorado Parks and Wildlife (CPW), 2 from Delta County, 1 from Western Area Power Administration

(WAPA), and 1 from a recreation advocacy group. Additionally, 11 letters from business and industry interests and 4 letters from individuals were received in support of the project. All comment letters were reviewed and considered in the development of the EA. The following is a summary of those comments and responses by resource:

*Air Quality.* One comment expressed support for the proposed MDWs.

*Fish and Wildlife.* CPW noted the entire area is within deer and elk winter range. Recommendations include implementing seasonal timing restrictions to address impacts to wintering big game; avoiding stream disturbances during June and July to avoid impacts to spawning cutthroat trout; and fencing and netting the reserve pits to exclude wildlife access. Additionally, CPW recommends that bear proof waste containers be used to avoid conflicts with bears.

*General.* Several comments in support of the project were received, citing past business practices of Bowie, enhanced coal recovery, and the positive socioeconomic impacts to the region.

*Land Use.* WAPA asked that the BLM require a stipulation requiring the lessee to avoid negatively impacting the authorized rights-of-way; if impacts are unavoidable, then the BLM will consult with the right-of-way holder. WAPA specifically requested that the stipulations include a 100-foot clearance from any underground mining activities around the transmission line structure foundations

*Migratory Birds.* CPW recommended preconstruction raptor surveys and requested CPW's raptor nest buffer guidelines be followed.

*Noxious and Invasive Species.* One comment recommended controlling weeds on newly disturbed areas.

*Reclamation.* A comment stated that the GVB drill pads and associated roads are temporary features that will be fully restored upon completion of the mining activities. CPW recommended reseeding with wildlife friendly seed mix.

*Recreation.* Thunder Mountain Wheelers stated that public recreational use, specifically big game hunting, would not be negatively impacted.

*Socioeconomics.* Numerous comments were in support of the project, citing the positive socioeconomic benefits from coal mining in the area.

*Transportation and Access.* CPW recommended keeping the drill roads closed to public use and reclaiming all new roads and pads as drilling is accomplished. WAPA asked that the BLM include a stipulation in the lease to ensure protection of WAPA's transmission line and access and maintain a minimum 100-foot clearance from any underground mining activities around the transmission line structure foundations. Additionally, no access or spur road should be blocked, damaged or otherwise occupied such that WAPA linemen and others responsible for the

maintenance and operation of WAPA's transmission lines are prevented from completing their work.

*Threatened and Endangered/Special Status Species.* CPW raised special concern regarding impacts to greenback cutthroat trout in the Terror Creek drainage, recommending no surface disturbance within 300 feet of any water within the Terror Creek Watershed and minimizing stream disturbances during June and July to avoid impacts to spawning cutthroat trout. Additionally, a recommendation was made to minimize impacts to migratory birds, including nesting raptors.

*Wetland and Water Resources.* CPW recommended using the best methods possible to control runoff to reduce silt buildup in area waterways; no surface disturbance within 300 feet of any water within the Terror Creek Watershed; locating staging and refueling, or chemical storage areas, outside riparian zones and floodplains; and disinfecting equipment and tools previously used in a river, stream, lake, pond or wetland prior to moving to another waterbody to avoid spreading aquatic nuisance species or other undesirable biota.

## **Public Review of Preliminary EA**

Approximately 15 letters or other forms of comment were received on the preliminary EA during the 30-day public review period. They include: one from the National Park Service, one from Western Area Power Administration, two from environmental groups, and one from Bowie Resources LLC. Five sets of comments from business/industry interests expressed concerns about the Proposed Action and five comments from individuals supported the Proposed Action. All comments were reviewed and considered in the development of the final EA. These comments are on file with the BLM. The following is a general summary of the comments and agency responses by resource:

***Air Quality.*** Comments questioned the analysis completed in the preliminary EA. Requests were made for a greater level of analysis of coal combustion at power plants utilizing the coal produced at the mine. Additional detail was also requested related to volatile organic compound (VOC) emissions associated with methane venting activities. Other comments were related to dust from vehicle travel associated with mine development in the future.

*Agency Response.* The EA Air Quality section provides emission calculations using average emissions for combustion at U.S. facilities. The EA notes that the current Bowie No. 2 Mine is not a significant source of NO<sub>x</sub> and VOC emissions (the photochemical reactivity potential of methane in the troposphere is considered negligible [40 CFR 51.100(s)]) and therefore operations at the mine are not expected to contribute significantly to any regional ozone formation potential. The Air Quality section includes stipulations to prevent or minimize fugitive dust. The EA is tiered to the 2000 North Fork Coal EIS and has described and analyzed the air resources based upon the most current information and standards available.

***Fish, Migratory Birds and Wildlife.*** Concern was expressed about proposed mitigation for the greenback cutthroat trout, migratory birds, and habitat for species which occupy the West Fork of Terror Creek and the LBA tract.

Agency Response. Several changes to the text have been made in the proposed stipulations protecting wildlife.

**General.** Several comments in support of the project were received, citing past business practices of Bowie, enhanced coal recovery, and the positive socioeconomic impacts to the region.

Agency Response. No changes to text required.

**Watershed, Water Systems/Storage and Land Use.** Concern was expressed about the impacts of mining and exploration activity on the integrity of water collection, storage and distribution systems, and the watershed.

Agency Response. The stipulations in the Geology and Minerals section, as well as the Threatened and Endangered Species section, would protect all surface resources, including any water collection, and storage and distribution systems. Additional language has been added to the stipulations requiring an augmentation plan and additional post mining water quality, quantity, and habitat monitoring. Additional review of the mine plan will occur, as noted in the introduction to the EA, and new or additional stipulations could be added at that time.

**Soils and Reclamation.** Comments expressed concern that much of the area is characterized by steep, unstable, highly erodible slopes and requested that a no surface occupancy stipulation be placed on slopes in excess of 40 percent.

Agency Response. The stipulations in the Geology and Minerals section ensure adequate overview of surface disturbance on steep slopes. The stipulations include:

- No surface occupancy would be allowed in areas of high geologic hazard or high erosion potential or slopes greater than 60 percent.
- Special interdisciplinary team analysis and mitigation plans detailing construction and mitigation techniques may be required on areas where slopes range from 40-60 percent. The interdisciplinary team could include engineers, soil scientist, hydrologist, landscape architect, reclamation specialist and mining engineer.

**Mitigation and Monitoring.** Comments requested that prior to commencement of mining operations beneath West Terror Creek, in-stream flow monitoring, both above and below the surface areas affected by mining influence be in place and operational. The purpose of such monitoring is to determine whether water is being lost in transit over the affected area.

Agency Response. The stipulations in the Geology and Minerals and the Threatened and Endangered Species sections would protect all surface resources. Stipulations include:

- If subsidence adversely affects surface resources in any way (including, but not limited to a documented water loss), the lessee, at their expense will be responsible to: restore stream channels, stock ponds, protect stream flow with earthwork or temporary culverts, restore affected roads, or provide other measures to repair damage or replace

any surface water and/or developed groundwater source, stock pond, water conveyance facilities, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, livestock and wildlife use, or other land uses as authorized by 36 CFR 251. An appropriate augmentation plan for replacement water will be decreed prior to commencing mining activities and will consider drought conditions and the limitations of local water supplies.

- The operator/lessee would be required to perform adequate baseline studies to quantify existing surface and subsurface resources. Existing data can be used for baseline analyses provided that the data is adequate to locate, quantify, and demonstrate interrelationships between geology, topography, hydrogeology, and hydrology. The operator/lessee would be required to establish or amend a monitoring program to be used as a continuing record of change over time of area resources in order to assess mining induced impacts. The monitoring program shall provide the procedures and methodologies to adequately assess interrelationships between geology, topography, hydrogeology, and hydrology identified in the baseline assessment to mining activities. The monitoring program shall incorporate baseline data so as to provide a continuing record over time.

***Environmental Policy.*** Commenters requested that the BLM and FS prepare an Environmental Impact Statement to analyze and assess the impacts of the proposed lease. They did not support the BLM/FS Finding of No Significant Impact on the Spruce Stomp Lease Application.

Agency Response. Both agencies have taken a comprehensive and thoughtful review of the proposed impacts to the possible issuance of a coal lease in the future. The agencies have extensive experience in assessing and monitoring all of the mines in the North Fork Valley. The subsidence report prepared and reviewed by the agencies presents a professional analysis that supports the conclusions in the EA. In addition, as described in the EA, the Proposed Action is not anticipated to result in effects to water quality or quantity. The stipulations in the Geology and Minerals section, as well as the Threatened and Endangered Species section, would protect all surface resources, including any water collection and storage and distribution systems. This EA is tiered to the North Fork Coal EIS completed in 2000. Based on the analyzed effects, an EA is appropriate under NEPA.

***Wetland and Water Resource.*** The proposed expansion of coal extraction would be in the West Terror Creek watershed and beneath West Terror Creek. Comments expressed preference that no subsidence be allowed directly beneath West Terror Creek. Concerns included runoff damaging irrigation structures and delivering silt into the ditch system and damage to county roads, etc.

Agency Response. As described in the EA, the Proposed Action is not anticipated to result in effects to water quality or quantity. After the lease is awarded, the mine plan review process, described in the introduction section of the EA, would require no loss of water. The stipulations in the Geology and Minerals section, as well as the Threatened and Endangered Species section, would protect all surface resources, including any water collection and storage and distribution systems. The EA has been modified to add language requiring an augmentation plan and additional post mining water quality, quantity, and habitat monitoring.

## **PLAN CONFORMANCE REVIEW**

The Proposed Action is subject to, and has been reviewed for, conformance with the BLM Unsuitability Criteria for coal leasing (see Appendix A), the BLM Resource Management Plan (RMP), and the USFS Land and Resource Management Plan (LRMP or Forest Plan).

### **Bureau of Land Management**

The Proposed Action is in conformance with the following BLM RMP (BLM, 1989) (43 CFR 1610.5-3, 1617.3):

Name of Plan: Uncompahgre Basin RMP

Date Approved: July 26, 1989, as amended

Decision Number/Page: Management Unit 7, pg. 21, and Management Unit 9, pg. 22.

Decision Language: Management Unit 7: “The management unit will be managed for both existing and potential coal development. Development of existing coal leases will continue and non-leased federal coal will be identified as acceptable for further coal leasing consideration with a minimum of multiple-use restrictions. Activities and land uses that are consistent with maintaining existing coal operations and the potential for coal development will be permitted.”

Management Unit 9: “The management unit will be managed to restore and enhance riparian vegetation along 48 miles of streams.” “Coal development will be considered on a site-specific basis after consultation with affected entities and formulation of mitigating measures.”

### **USDA Forest Service**

The Proposed Action is in conformance with the following Forest Service Plan:

Name of Plan: 1991 Amendment of the GMUG Land and Resource Management Plan

Date Approved: September 1991

Decision: The GMUG National Forests made provisions for coal leasing subject to the application of the coal unsuitability criteria established in 43 CFR 3461 (see Appendix E to the LRMP). In addition, as allowed in 43 CFR 3461.2-1(b)(1) and 3461.3-1(b)(1), the specific lands in this proposal was reviewed for unsuitability by the Forest Service and a recommendation to the Secretary of the Interior will be made who will determine whether there are no significant recreational, timber, economic, or other values which may be incompatible with the lease (43 CFR 3461.5(2)(i), see Appendix A-Unsuitability Analysis Report). None of the lands were found to be unsuitable based on the criteria; see Appendix A-Unsuitability Analysis Report). The LRMP also provided for criteria to consider for the applicable protection of specific surface resources as addressed in Section III, General Direction, pages 63-69 of the LRMP.

Multiple use management area prescriptions as designated in the Forest Plan for the lands bounded by the LBA tract are summarized below:

- 4B-Wildlife habitat management for one or more management indicator species. Livestock grazing will be compatible with wildlife habitat management.
- 4C-Wildlife habitat improvement. Vegetation treatment in hardwood and shrub dominated land. Livestock grazing will be compatible with wildlife habitat management.
- 9A-Riparian/Aquatic Ecosystems. Emphasis is on the management of all the components of aquatic/riparian ecosystems to provide healthy, self-perpetuating plant communities, acceptable water quality standards, and habitats for viable populations of fish and wildlife, and stable stream channels and still water body shorelines. Mineral activities may occur but must minimize disturbance to riparian areas and initiate timely and effective rehabilitation of disturbed areas and restore them to a state of productivity comparable to that before disturbance.

The Proposed Action conforms to the overall guidance given in the LRMP, as amended (1991), which encourages environmentally sound energy and mineral development. No additional restrictions or need for stipulations were identified as a result of applying the criteria (see Appendix A).

### **Other Related NEPA Documents:**

This EA tiers to the 2000 USFS and BLM Environmental Impact Statement (EIS) for the Iron Point Exploration License, the Iron Point Coal Lease Tract and the Elk Creek Coal Lease Tract (North Fork Coal EIS - USFS and BLM, 2000). The air quality modeling and analysis included in the 2000 North Fork Coal EIS (pages 3-3 to 3-17 and Appendix M) has been used and updated for the air quality analysis in this EA (additional air quality data was used in this analysis, see the Air Quality and Climate section below). The transportation and geology sections of the North Fork Coal EIS have also been used in this EA analysis.

In August 2012, the BLM completed EA-DOI-BLM-CO-SO50-2012-0001, which was related to modifications of Bowie coal leases COC-37210 and COC-61209 of approximately 502.43 acres. The lease modifications have been approved and issued by the BLM.

### **Standards for Public Land Health**

In January of 1997, the Colorado BLM approved the Standards for Public Land Health (see Table 2). These standards describe conditions needed in order to sustain public land health in relation to all uses of public lands. A finding for each Standard has been made in the Affected Environment and Environmental Consequences/Stipulations section of this EA. These findings only apply to the BLM land and mineral resources within the LBA tract.

**Table 2  
Standards for Public Land Health**

<b>Standard</b>	<b>Definition/Statement</b>
Standard 1 Upland Soils	Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, land form, and geologic processes. Adequate soil infiltration and permeability allows for the accumulation of soil moisture necessary for optimal plant growth and vigor, and minimizes surface run-off.
Standard 2 Riparian Systems	Riparian systems associated with both running and standing water function properly and have the ability to recover from major surface disturbance, such as fire, severe grazing, or 100-year floods. Riparian vegetation captures sediment, and provides forage, habitat, and bio-diversity. Water quality is improved or maintained. Stable soils store and release water slowly.
Standard 3 Plant and Animal Communities	Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential. Plants and animals at both the community and population level are productive, resilient, diverse, vigorous, and able to reproduce and sustain natural fluctuations, and ecological processes.
Standard 4 Threatened and Endangered Species	Special status, threatened and endangered species (federal and state), and other plants and animals, and their habitats, officially designated by the BLM, are maintained or enhanced by sustaining healthy, native plant and animal communities.
Standard 5 Water Quality	The water quality of all waterbodies, including groundwater where applicable, located on or influenced by BLM-managed public lands will achieve or exceed the Water Quality Standards established by the State of Colorado. Water Quality Standards for surface and ground waters include the designated beneficial uses, numeric criteria, narrative criteria, and anti-degradation requirements set forth under state law as found in (5 CCR 1002-8), as required by Section 303I of the Clean Water Act.

## **AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND STIPULATIONS**

This section describes the human and natural environmental resources that could be affected by the Proposed Action and presents comparative analyses of the direct and indirect effects on the environment. A description of the past, present, and reasonably foreseeable actions is included at the end of this section.

Within each resource area, evaluation 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 – Impacts that are caused by the action and that occur at the same time and in the same general location as the action. For purpose of impact assessment, impacts caused by mine subsidence are not considered to be surface disturbance in the EA due to the depth of overburden within the tract and the unlikely occurrence of observable surface disturbance.
- Indirect impacts – Impacts that occur at a different time or in a different location than the action to which the impacts are related.
- Short or long-term impacts – When applicable, the short-term or long-term aspects of impacts are described. For the 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 on the environment that result from incremental impact of the action when added to other past, present, and reasonably foreseeable future action. For each resource, an analysis area was defined to adequately measure cumulative effects of each alternative. Reasonably foreseeable surface use described in **Cumulative Impacts Section** is considered in the direct and indirect effects analysis and in the cumulative effects section.

Elements specified by statute, regulation, executive order, other resources, or the Standards for Public Land Health are described and analyzed in this section. Table 3 lists the elements considered in this section; those that could be impacted are brought forward for analysis. Any element not affected by the Proposed Action or No Action alternatives will not be analyzed in this document, and the reasons for no impact will be stated. Environmental impact analysis was based upon available data and literature from state and federal agencies, peer-reviewed scientific literature, and resource studies conducted in the proposed lease application area.

There are no Areas of Critical Environmental Concern (ACECs), Wilderness Areas, Lands with Wilderness Characteristics, Colorado Roadless Areas, Prime or Unique Farmlands, or Floodplains within the LBA tract. In addition, Timber Management is not brought forward for analysis, because while the area contains NFS lands, the predominant land use is not timber production.

**Table 3  
Environmental Assessment Resource Areas**

<b>Element</b>	<b>Not Applicable or Not Present</b>	<b>Present, but No Impact</b>	<b>Applicable and Present; Brought Forward for Analysis</b>
Air Quality and Climate			X
ACEC	X		
Wilderness	X		
Lands with Wilderness Characteristics	X		
Wild and Scenic Rivers			X
Cultural Resources			X
Native American Religious Concerns	X		
Farmlands, Prime/Unique	X		
Soils			X
Vegetation			X
Invasive, Non-native Species			X
Threatened and Endangered Species			X
Migratory Birds			X
Wildlife, Terrestrial			X
Wildlife, Aquatic			X
Wetlands and Riparian Zones			X
Floodplains	X		
Water Quality, Surface and Ground			X
Wastes, Hazardous or Solid			X
Environmental Justice		X	
Access			X
Transportation			X
Cadastral Survey	X		
Realty Authorizations			X
Range Management			X
Timber Management		X	
Wildfire			X
Hydrology/Water Rights			X
Noise			X
Recreation			X
Visual Resources			X
Geology and Minerals			X
Paleontology			X
Law Enforcement	X		
Socio-Economics			X

## **AIR QUALITY and CLIMATE**

### **Affected Environment**

The project effects and cumulative analysis area for air quality is the upper portion of the regional airshed, which generally corresponds to the watershed for the North Fork of the Gunnison River upstream from Paonia.

Paonia, Colorado is located in the North Fork Gunnison River Valley at an elevation of approximately 5,682 feet. The area is rural with mountainous terrain. The normal temperatures (min and max) for the area range from 14.4 to 38.6 °F in January to 53.4 to 88.9 °F in July. The

average annual precipitation amounts to approximately 14.02 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 miles per hour (mph). The area enjoys sunshine for approximately 70 percent of the time and has an annual average sky cover of around 52 percent (Western Regional Climate Center, 2012).

Air quality in the region, which is generally made up of smaller towns, usually located in fairly broad river valleys, is affected by multiple activities currently conducted within the area. The lease tract is located near the boundaries of Delta and Gunnison counties, and so it is reasonable to conclude that indirect and cumulative effects for the area would be influenced in the near field by sources of emissions within each county's respective emissions inventory. Activities occurring within the region that affect air quality include stationary facilities such as coal mining and subsequent coal mining operations (e.g., loading), concrete mix plants, gravel pits, lime storage facilities, natural gas-fired electrical generating plants, natural gas dehydration facilities, landfills, etc. Portable source examples include facilities such as gravel crushers, associated processing equipment, and asphalt plants. Mobile sources of emissions within the region include highway or on-road vehicles, and off-road vehicles such as construction-related equipment (dozers, loaders, backhoes, etc.) and recreational vehicles (snowmobiles, all terrain vehicles - ATVs, and dirt bikes). Smoke from grass and forest fires represent area source emissions that can have an impact on air quality.

### **Regulatory Framework**

The Clean Air Act (CAA), which was last amended in 1990, requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) (40 CFR 50) for criteria pollutants. Criteria pollutants are air contaminants that are commonly emitted from the majority of emissions sources and include carbon monoxide (CO), lead (Pb), sulfur dioxide (SO<sub>2</sub>), particulate matter (including PM<sub>10</sub>, which refers to particles smaller than 10 microns in effective diameter, and PM<sub>2.5</sub>, which refers to particles smaller than 2.5 microns in effective size), ozone (O<sub>3</sub>), and nitrogen dioxide (NO<sub>2</sub>).

The CAA established two types of NAAQS:

*Primary standards:* – Primary standards set limits in order to protect public health, including the health of "sensitive" populations (such as asthmatics, children, and the elderly).

*Secondary standards:* – Secondary standards set limits in order to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

The EPA regularly reviews the NAAQS (every 5 years) to ensure that the latest science on health effects, risk assessment, and observable data such as incidence rates are evaluated in order to re-propose any NAAQS to a lower limit if the data supports the finding.

The Colorado Air Pollution Control Commission, by means of an approved State Implementation Plan (SIP) and/or delegation by the EPA, can establish state ambient air quality

standards for any criteria pollutant that is at least as stringent as, or more so, than the federal standards. Ambient air quality standards must not be exceeded in areas where the general public has access. Table 4 lists the federal (NAAQS) and the Colorado Ambient Air Quality Standards (CAAQS) ambient air quality standards.

**Table 4**  
**Ambient Air Quality Standards <sup>1</sup>**

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 µg/m <sup>3</sup> <sup>(2)</sup>	Not to be exceeded
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]		Primary	1-hour	100 ppb	98 <sup>th</sup> percentile, averaged over 3 years
		Primary and Secondary	Annual	53 ppb <sup>(3)</sup>	Annual Mean
Ozone [73 FR 16436, Mar 27, 2008]		Primary and Secondary	8-hour	0.075 ppm <sup>(4)</sup>	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution [Dec. 14, 2012]	PM <sub>2.5</sub>	Primary and Secondary	Annual	12 µg/m <sup>3</sup>	Annual mean, averaged over 3 years
			24-hour	35 µg/m <sup>3</sup>	98 <sup>th</sup> percentile, averaged over 3 years
	PM <sub>10</sub>	Primary and Secondary	24-hour	150 µg/m <sup>3</sup>	Not to be exceeded more than once per year on average over years
Sulfur Dioxide [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sep 14, 1973]		Primary	1-hour	75 ppb <sup>(6)</sup>	99 <sup>th</sup> percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary	Annual	0.0267 ppm <sup>(7)</sup>	Arithmetic Average
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

(1) National Ambient Air Quality Standards (<http://www.epa.gov/air/criteria.html>).

(2) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m<sup>3</sup> as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated non-attainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(3) The official level of the annual NO<sub>2</sub> standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(4) 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.

(5) The PM<sub>2.5</sub> Secondary Standard (Annual) --15 µg/m<sup>3</sup>--annual mean, averaged over 3 years

(6) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO<sub>2</sub> 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 non-attainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved. (b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard. (c) EPA is in the process of reconsidering these standards (set in March 2008).

(7) Colorado Primary Standard

NOTE: Air quality in the Delta and Gunnison County Air Sheds currently meets all NAAQS and CAAQS.

## **Emissions Source Classifications and Regulatory Authority**

Emissions sources are generally regulated according to their type and classification. Essentially all emissions sources fall into two broad categories, stationary and mobile. Stationary sources are generally non-moving, fixed-site producers of pollution such as power plants, chemical plants, oil refineries, manufacturing facilities, and other industrial facilities. This source class can also cover certain types of portable sources. Stationary facilities emit air pollutants via process vents or stacks (point sources) or by fugitive releases (emissions that do not pass through a process vent or stack). Stationary sources are also classified as major and minor. A major source is one that emits, or has the potential to emit, a regulated air pollutant in quantities above a defined threshold (100 or 250 tons per year, depending on the source classification). Stationary sources that are not major are considered minor or area sources. A stationary source that takes federally-enforceable limits on production, consumption rates, or emissions to avoid major source status is considered a synthetic minor source. The Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division (APCD) has authority under their approved SIP, or by EPA delegation, to regulate and issue air permits for stationary sources of pollution in Colorado.

Mobile sources include any air pollution that is emitted by motor vehicles, engines, and equipment that can be moved from one location to another (typically under their own power). Due to the large number of sources, which includes cars, trucks, buses, construction equipment, lawn and garden equipment, aircraft, watercraft, motorcycles, etc., and their ability to move from one location to another, mobile sources are regulated differently than stationary sources. In general, the EPA and other federal entities retain authority to set emissions standards for these sources depending on their type (on-road or off-road) and class (light duty, heavy duty, horsepower rating, weight, fuel types, etc.). Mobile sources are not regulated by the state (the State of California is the exception) unless they are covered under an applicable SIP specific to a non-attainment or maintenance area.

**Criteria Pollutants.** Of all the criteria pollutants, only ground level ozone and secondary formation particulate matter (PM<sub>2.5</sub>), also known as condensable particulate matter, are not directly emitted by emissions sources. Ozone is chemically formed in the atmosphere via interactions of oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOCs) in the presence of sunlight and under certain meteorological conditions (NO<sub>x</sub> and VOCs are ozone precursors). Ozone formation and prediction is complex, generally results from a combination of significant quantities of VOCs and NO<sub>x</sub> emissions from various sources within a region, and has the potential to be transported across long ranges. Therefore, it is typically not appropriate to assess potential ozone impacts of a single project on potential regional ozone formation and transport. Further, the relative amounts of ozone precursor emissions, NO<sub>x</sub> and VOCs, that would be emitted from the mine are quite small. Because the area is not currently experiencing any issues with ozone, and there is no anticipated change in the annual emissions of ozone precursors as a result of the tract being mined, photochemical modeling would be quite unlikely to show any measurable impacts from the mine's emissions. For these reasons, ozone will not be further addressed in this document beyond the related precursor discussions. The relative differences in project and regional precursor emissions are available for review in Tables 5 and 6.

The EPA defines PM<sub>2.5</sub> as particulate matter with an aerodynamic diameter less than or equal to 2.5 microns in size. According to the EPA, the chemical composition of PM<sub>2.5</sub> is characterized in terms of five major components that comprise the mass of pollutant. In the West, organic carbon (OC) is generally the largest estimated component of PM<sub>2.5</sub> by mass. Primary emissions of PM<sub>2.5</sub> are generally from combustion processes with fireplaces, woodstoves, and wildfire being important contributors to OC. A minority component of PM<sub>2.5</sub> is made up of crustal elements (i.e., fugitive dust). Some types of fine particles are formed in the atmosphere from emissions of nitrogen oxide and sulfur dioxide gases and are referred to as secondary or condensable particulates. The mine does not emit large quantities of these gases when compared with regional emissions. Therefore, secondary PM<sub>2.5</sub> will not be addressed in more detail than a general discussion of particulates. Further, full photochemical grid modeling (which would be required to quantitatively estimate secondary PM<sub>2.5</sub> formation) is not appropriate nor warranted at this scale (i.e. individual project level analysis).

**Hazardous Air Pollutants (HAPs).** Toxic air pollutants, also known as hazardous air pollutants (HAPs), are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. The majority of HAPs originate from stationary sources (factories, refineries, power plants) and mobile sources (e.g., cars, trucks, buses), as well as indoor sources (building materials and cleaning solvents). No ambient air quality standards exist for HAPs, instead emissions of these pollutants are regulated by a variety of laws that target the specific source class and industrial sectors for stationary, mobile, and product use/formulations. The majority of HAPs emitted from Bowie's operations are the result of the on-road and non-road vehicle use.

**Greenhouse Gases (GHGs).** Gases that trap heat in the atmosphere are often called greenhouse gases, and include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and several fluorinated species of gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Carbon dioxide is emitted from the combustion of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). Methane is emitted during the production and transport of coal, natural gas, and oil. Methane also results from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Fluorinated gases are powerful greenhouse gases that are emitted from a variety of industrial processes and are often used as substitutes for ozone-depleting substances (i.e., CFCs, HCFCs, and halons). All of the different gases have various capacities to trap heat in the atmosphere, which are commonly referred to as the gases' global warming potential (GWP). Carbon dioxide has a GWP of 1, and so for the purposes of analysis the global warming potential of a greenhouse gas is generally expressed in terms of carbon dioxide equivalents (CO<sub>2</sub>e), or the amount of CO<sub>2</sub> that would possess an equivalent amount of warming potential.

As with the HAPs, ambient air quality standards do not exist for GHGs. In its Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the CAA, the EPA determined that GHGs are air pollutants subject to regulation under the CAA. The most recent rules promulgated to regulate the emissions and the industries responsible are the Mandatory Reporting Rule (74 FR 56260) and the Tailoring Rule (70 FR 31514). Under the

EPA's GHG Mandatory Reporting Rule, underground coal mines subject to the rule are required to report emissions in accordance with the requirements of Subpart FF. Under the provisions of the Tailoring Rule (step 2 – July 2011) a new facility would be subject to Prevention of Significant Deterioration (PSD) permitting if it has the potential to emit GHGs in excess of 100,000 tons per year (tpy) of CO<sub>2</sub>e equivalent and 100/250 tpy of GHGs on a mass basis. For existing facilities this review would take place during any subsequent modifications to the facility (CDPHE's anticipated implementation strategy).

The EPA is also planning to develop stationary source GHG emissions reduction rules (New Source Performance Standards - NSPS) that could mandate substantial reductions in U.S. greenhouse gas emissions. Alternatively, Congress may develop cap-and-trade legislation as another means to reduce GHG emissions. Consequently, GHG emissions from coal burned at power plants may be regulated in the near future. The first EPA regulation to limit emissions of GHGs imposed carbon dioxide emission standards on light-duty vehicles, including passenger cars and light trucks. As of April 2013, the EPA had not set GHG emission standards for stationary sources (such as compressor stations); however, the EPA is gathering detailed GHG emission data from thousands of facilities throughout the U.S., and will use the data in order to develop an improved national GHG inventory, as well as to establish future GHG emission control regulations.

**Black Carbon.** Black carbon is a by-product of incomplete combustion of fossil fuels, biofuels, and biomass. It can be emitted when coal is burned, as well as through tailpipe emissions from engines that use diesel fuel (such as diesel trucks and locomotives). Black carbon, therefore, is a likely by-product that would be emitted from haul trucks used during coal mining operations. Black carbon emissions from diesel tailpipe emissions are largely dependent upon the composition of the diesel fuel, and not upon the type of engine used. Black carbon is an unregulated pollutant; however, the EPA does regulate diesel fuel quality, such that, in recent years diesel fuel quality has been improved.

Black carbon is not emitted from the coal when it is being mined, but is likely to occur when the coal is combusted. Black carbon emissions associated with coal combustion occur at the facility where the coal is being burned, not where it is being mined. It is a component of the anthropogenic global warming phenomenon, and acts to warm the earth's atmosphere by reducing the ability to reflect sunlight (albedo). It is the second highest contributor to global warming; however it is very short-lived, staying in the atmosphere only a few days to a few weeks. This analysis does not quantify or analyze indirect emissions of black carbon associated with the coal's combustion because the BLM cannot determine which facilities will burn the coal (in order to produce electricity). Since power plant facilities differ considerably in their use of emissions controls (which would, in turn, greatly affect the emissions associated with burning the coal), it is not feasible to estimate the black carbon emissions that would result.

### **Air Quality Designations**

Air quality (any geographical area that defines the class boundary) is categorized as either attainment (an area where the air does not exceed NAAQS specified concentrations of a criteria pollutant) or non-attainment (an area where the air does exceed NAAQS specified concentrations

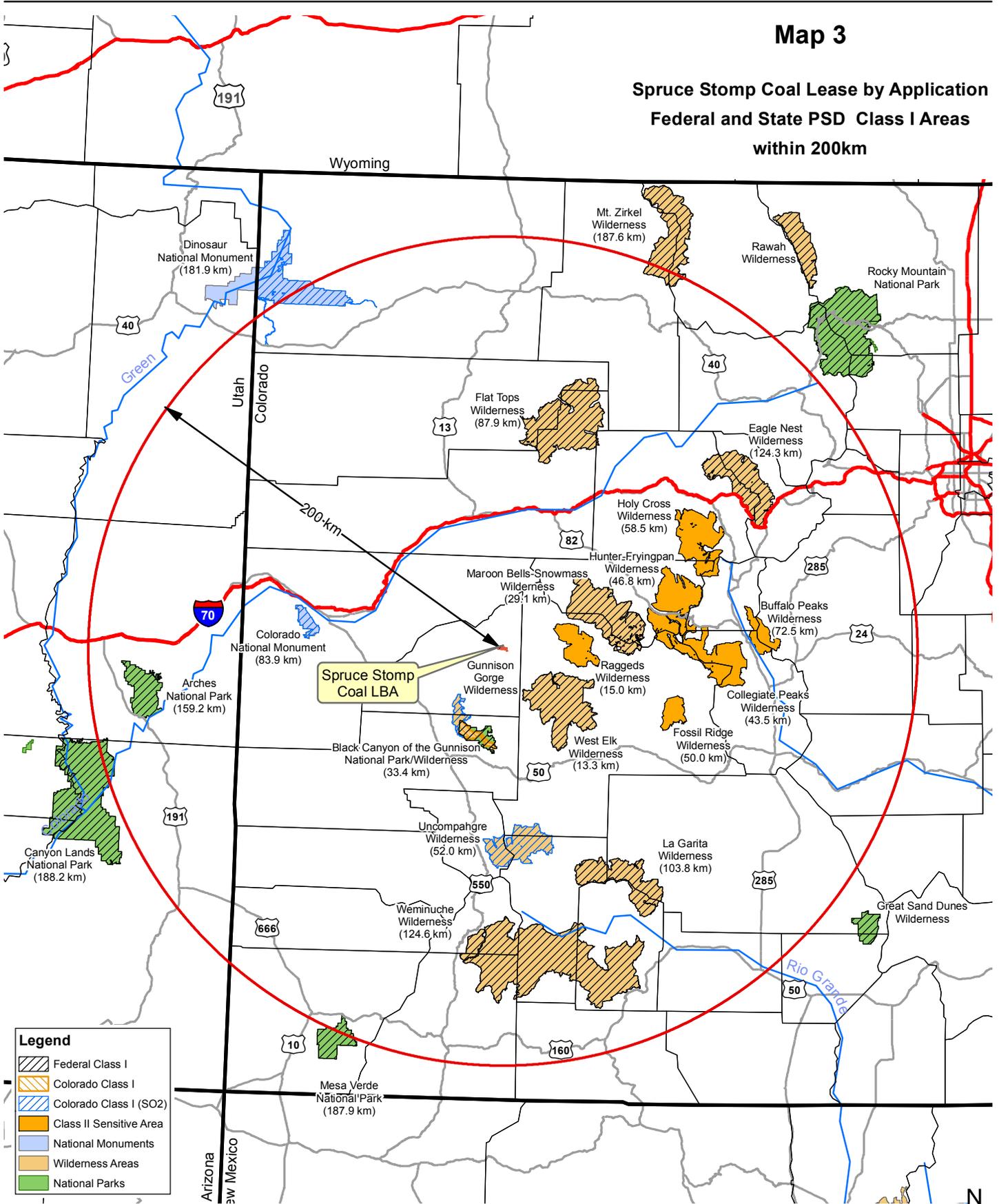
of a criteria pollutant). Two additional subset categories of attainment exist for those areas where a formal designation has not been made, i.e., Attainment/Unclassifiable (generally rural, or natural areas), and for areas where previous violations of the NAAQS have been documented, but pollution concentrations no longer exceed NAAQS concentrations, i.e., Attainment/Maintenance areas. Further, all geographical regions are assigned a priority Class (I, II, or III) which describes how much degradation to the existing air quality is allowed to occur within the area under the PSD permitting rules. Class I areas are areas of special national or regional natural, scenic, recreational, or historic value, and essentially allow very little degradation in air quality, while Class II areas allow for reasonable industrial/economic expansion. There are currently no Class III areas defined in Colorado. The closest federal mandatory Class I areas located near the LBA tract are the West Elk Wilderness Area (approximately 8 miles southeast), Maroon Bells-Snowmass Wilderness Area (approximately 18 miles northeast), and the Black Canyon of the Gunnison National Park and Wilderness Area (approximately 21 miles south-southwest). Map 3 illustrates the location of these and other regional PSD Class I areas relative to the LBA tract.

For an area that is in attainment for the NAAQS and CAAQS, the CAA provides specific criteria for stationary sources to allow for economic growth under the PSD permitting rules (40 CFR 52.21 or 40 CFR 51.166 for SIP approved Rules). Major PSD sources are required to provide an analysis to ensure their emissions in conjunction with other applicable emissions increases and decreases will not cause or contribute to a violation of any applicable NAAQS or PSD increment. A PSD increment is the amount of pollution an area is allowed to increase while preventing air quality in the airshed from deteriorating to the level set by the NAAQS. The NAAQS is a maximum allowable concentration "ceiling," while a PSD increment is the maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant. The baseline concentration is defined for each pollutant and, in general, is defined as the ambient concentration existing at the time that the first complete PSD permit application affecting the area is submitted. Significant deterioration is said to occur when the amount of new pollution would exceed the applicable PSD increment. Under no circumstance can the air quality of the airshed deteriorate beyond the concentration allowed by the applicable NAAQS. In addition, the analysis required for permitting must include impacts to surface waters, soils, vegetation, and visibility (also known as air quality related values - AQRVs) caused by any increase in emissions, and from associated growth. Associated growth is industrial, commercial, and residential growth that will occur in the area due to the source. Where a PSD source (with significant emissions) is located near a Class I airshed, the AQRV thresholds set by the applicable Class I controlling agency (Federal Land Manager) must be assessed to determine if an adverse impact on the area is likely to occur.

If a non-attainment designation takes effect for any criteria pollutant, the state will have three years to develop implementation plans outlining how areas will attain and maintain the NAAQS by reducing air pollutant emissions contributing to the violation. Further, any new major stationary source or major modification to a stationary source that emits a non-attainment pollutant in the designated area would be required to offset new or modified emissions sources in a ratio of greater than 1:1. Offset emission or emissions credits would be required to be obtained from within the designated non-attainment area.

# Map 3

## Spruce Stomp Coal Lease by Application Federal and State PSD Class I Areas within 200km



**Legend**

- Federal Class I
- Colorado Class I
- Colorado Class I (SO2)
- Class II Sensitive Area
- National Monuments
- Wilderness Areas
- National Parks

No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM



## Environmental Consequences/Stipulations

### Proposed Action

It is assumed that implementation of the Proposed Action would result in emissions of criteria pollutants, HAPs, and GHGs. Fugitive particulate matter would be emitted when drill rigs and other vehicles associated with the mining activities travel on existing dirt roads or overland access routes to MDW drilling locations. Emissions of particulate matter would be generated from processing equipment, material handling transfer points, storage piles, rail load-out locations, and mine ventilation shafts. Air quality would also continue to be impacted by fuel combustion sources, such as the engine exhaust emissions from locomotives, mobile material handling equipment, personnel transport equipment, and stationary internal combustion engines.

### Emissions Inventory

It is assumed that the Proposed Action would produce direct and indirect emissions of the above-identified pollutants from both stationary and mobile sources during mining operations. Production rates would not increase under the Proposed Action and therefore production emissions can reasonably be expected to be the same. No reasonably foreseeable increases in permitted emissions authorizations are anticipated by the implementation of the Proposed Action. As described above, however, there is anticipated to be approximately 35 additional MDWs drilled if the lease is issued. These are construction activities and are not permitted by CDPHE, but their development would be a source of air emissions, and those emissions are quantified herein.

**Direct Emissions.** With the exception of particulate matter, all of the directly emitted criteria pollutants originating from the mine's operations are from fuel combustion sources, such as mobile mining equipment and stationary emergency generators. HAPs and GHGs are also emitted from fuel combustion sources, albeit in de minimis (or minimal) amounts. The overwhelming majority of the site's GHG emissions are the result of methane drainage systems that are installed to reduce the combustion potential of the mine's underground atmosphere. The systems at the Bowie No. 2 Mine consist of Ventilation Air Methane (VAM), and MDW methane.

The majority of PM<sub>10</sub> emissions from the mining area are from miscellaneous sources, which are mainly fugitive dust sources rather than stack emissions or internal engine combustion sources. Fugitive emissions are those not caught by a capture system and are often due to equipment leaks, earth moving/quarrying, equipment and vehicles traveling on paved and unpaved roads, and windblown disturbances.

Stationary sources (including fugitive emissions) at the Bowie No. 2 Mine are regulated by CDPHE and are authorized by multiple APCD permits. The permits establish limits for stationary and other regulated emissions sources which maintain emission rates below certain applicability thresholds, allowing the mine to be classified as a synthetic minor source under New Source Review and the Title V Operating Permit program (for major sources), as well as a PSD minor source not subject to PSD permit requirements. Some stationary equipment at the site is covered by NSPS - Subpart Y, which specifies emissions standards for coal preparation

plants. Under the SIP PSD rules, the site is covered under one of the 28 named source categories (see CDPHE AQCR 3, Part D, Section II.A.24.e) which requires inclusion of any fugitive emissions related to the coal process operations in the site's potential to emit calculations for major source determination. The latest revisions made to the permit were issued prior to the implementation of the SIP rules for GHG permitting, and therefore the permit does not cover GHG emissions (including methane) from the mine. Stationary sources of direct emissions at the Bowie No. 2 Mine and within the lease area include the following:

- Material Processing Screens
- Material Processing Crushers
- Material Handling Conveyors
- Mine Ventilation
- Fugitive Dust from Surface Operations (material handling, stockpiles, MDW drilling)
- Coal Preparation
- Train Loading
- MDW Releases

Criteria pollutant emission rates, as permitted in CDPHE-APCD air quality permits 96DL103-1, 96DL103-6, 96DL103-7F, 98DL0726, 01DL0685, 03DL0099F, 03DL0596, 03DL0923F, 04DL0560, and 06DL1082F to which the Bowie No. 2 Mine is currently subject, are provided in Table 5.

HAP emissions from stationary sources are considered minimal, and there are no permitted sources of HAPs. HAP emissions are primarily emitted from on-road and nonroad mobile sources.

Mobile sources at the facility include underground mining equipment, listed under source classification code (SCC) 2270009010, and aboveground construction equipment identified under SCC 2270002000, as well as light duty gasoline trucks. The underground mining mobile sources are specialized, industry specific equipment designed to function in the unique environment of an underground mine, while the aboveground sources would be heavy construction equipment used for material handling, stockpile management, and drilling.

Emissions from mobile sources at the mine come from various types of equipment. As noted in the purpose and need section of the EA, this is a competitive lease and the BLM does not have specific data on the mine's mobile source equipment in order to produce a detailed emissions inventory for these sources. To produce this type of estimate, it would be necessary to know the exact number and types of equipment in use, as well as other information such as the age, horsepower, and hours of use for each piece of equipment.

**Table 5**  
**Estimated Direct Criteria and GHG Emissions from Stationary and Mobile Sources (tpy)**

<b>Stationary Sources</b>	<b>CDPHE-APDC Permit</b>	<b>Stationary PM<sub>10</sub></b>	<b>Fugitive PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>VOC</b>	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>SO<sub>2</sub></b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>
Screen	96DL103-1	6.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Crusher	96DL103-6	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conveyor Transfer, Haul, Stockpiles	96DL103-7F	4.2	161.2	NA	NA	NA	NA	NA	NA	NA	NA
Ventilation Shaft	98DL0726	14	NA	NA	NA	NA	NA	NA	NA	NA	NA
Train Loading	01DL0685	8.76	NA	NA	NA	NA	NA	NA	NA	NA	NA
Portal Development	03DL0099F	NA	39.7	NA	NA	NA	NA	NA	NA	NA	NA
Coal Prep/Wash Plant	03DL0596	8.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
GOB Handling	03DL0923F	NA	40	NA	NA	NA	NA	NA	NA	NA	NA
Underground Conveyor	04DL0560	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA
GOB Pile Operations	06DL1082F	2.1	55	NA	NA	NA	NA	NA	NA	NA	NA
Methane Sources	None	NA	NA	NA	NA	NA	NA	NA	ND	24,905	NA
<b>Mobile Sources<sup>2</sup></b>	<b>SCC</b>	<b>Mobile PM<sub>10</sub></b>	<b>Fugitive PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>NMOG</b>	<b>CO</b>	<b>NO<sub>x</sub></b>	<b>SO<sub>2</sub></b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>
Underground Mining Equipment	2270009000	6.82	Accounted for in permits above	6.62	10.46	40.38	47.97	0.65	3,031.54	0.16	0.02
Surface Mining Equipment	2270002036 2270002051 2270002060 2270002069 2270002033	1.79	Accounted for in permits above	1.73	2.18	11.55	24.68	0.39	1,795.79	0.03	0.02
MDW Drilling	NA	0.68	19.9	2.9	0.89	5.0	8.1	0.18	660.2	0.04	0.01
Gasoline Trucks	LDGT		0.03	0.03	0.05	0.73	0.08	0.02	107.64	NA	NA
<b>Total Direct Emissions (tons)</b>		<b>59.49</b>	<b>315.83</b>	<b>11.28</b>	<b>13.58</b>	<b>57.66</b>	<b>80.83</b>	<b>1.24</b>	<b>5,595</b>	<b>24,905</b>	<b>0.05</b>

<sup>1</sup> Mobile sources emissions are for exhaust only.

<sup>2</sup> All emissions reported in short tons.

However, there are data on the total amount of diesel fuel used by all of the mobile sources at the mine on an annual basis. By making some reasonable assumptions about the mobile equipment in use, the BLM was able to use an EPA emissions model known as nonroad (2008a) to estimate potential mobile source emissions. The model was run for Delta and Gunnison counties using available mobile source inventories for the year 2000 and emissions factors for typical mobile sources were obtained from the model. This year was chosen to be reasonably conservative, as mobile equipment from the year 2000 would be likely to have been replaced in the last thirteen years by newer equipment with lower emissions. The BLM also made reasonable assumptions of the types of equipment likely to be used and the typical thermal efficiencies associated with these types of sources. With these assumptions, it was possible to estimate potential criteria pollutant and greenhouse gas emissions from the data on total diesel fuel use. Appendix D provides more detail on how these calculations were made. The resulting mobile source emissions estimates are shown in Table 5.

For the light duty gasoline trucks (LDGT), the analysis used the corporate average fuel efficiency (CAFE) mileage standards for the model year (MY) 2004 to estimate total vehicle miles travelled (VMT) from the fuel use data that was provided by the mine. The VMT data was then multiplied by the pollutant specific emissions factors for MY 2004 LDGT to derive emissions. The 2004 factor was chosen to be conservative and to reflect the fact that gasoline engines do not last as long as typical diesel powered equipment used at similar rates.

**Indirect Emissions.** Electrical energy consumed at the site can reasonably be expected to produce emissions from the supplying source, unless that source is some form of renewable energy. It is possible to provide rough estimates of emissions from mine electricity consumption if the annual energy consumption and supplier data is known, however the consumption information is not available to the BLM at this time.

Train emissions from hauling the mined and processed coal were accurately quantified in the original 2000 North Fork Coal EIS prepared for the mine and are discussed further below. The analysis tiers to the referenced EIS in support of the rail emissions discussion. Rail hauling emissions would continue under the Proposed Action.

Combustion of the mined and processed coal will produce all of the emissions outlined above. According to the U.S. Energy Information Administration (2009), nearly 94 percent of all coal consumed in the U.S. during 2009 was used in the generation of electric power. Bowie ships 95 to 98 percent of their coal to electric utilities with the remainder going to various manufacturing plants such as coke and cement. It would be possible to provide a quantification of criteria, GHG, and HAP emissions associated with the burning of the mined coal at a specific facility; however, the types and location of the facilities the coal might be processed and consumed in is speculative and not foreseeable. The contractual agreements between the coal fired power plant and the coal supply company are outside the scope of this analysis, and the BLM does not determine at which facilities the coal is used. Different emissions control devices on a power plant could greatly affect the amount of criteria, HAP and GHG emissions that are released into the atmosphere. For example, a power plant that is equipped with selective catalytic reduction or practices CO<sub>2</sub> capture would ultimately release much smaller quantities of NO<sub>x</sub> and CO<sub>2</sub> than a power plant lacking such controls.

Even though the BLM cannot reasonably say where the coal is ultimately going to be burned, it is still possible to do emissions calculations to estimate the associated CO<sub>2</sub> emissions from the combustion of the coal. The specific information required, i.e., the number of tons of coal produced per year from the mine, and the heat content or carbon content of that coal in BTUs or percent weight per ton, is known for the proposed lease area. However, because the type of facility the coal might be processed in (i.e., the control efficiency of the facility) is speculative, calculations were made using average numbers for U.S. facilities. Therefore, the emissions calculation does not represent actual GHG emissions from this specific project. Assuming the Proposed Action would generate 5.0 million tons of high-quality low-sulfur super compliant bituminous coal per year, with an average heat content of 24.2 million BTUs per ton, nearly 12.12 million metric tons of CO<sub>2</sub>e would be emitted. This amount represents 10.14 percent of all CO<sub>2</sub>e emissions in Colorado during 2007, 0.18 percent of all CO<sub>2</sub>e emissions in the U.S. during 2007, and 0.05 percent of global CO<sub>2</sub> emissions during 2007 (Climate Analysis Indicator Tool - CAIT-US, 2011). These calculations are based upon default emission factors for stationary combustion in the energy industries (Intergovernmental Panel on Climate Change - IPCC, 2006), assuming no other use of the coal and complete total combustion, and therefore represent a highly conservative overestimate of potential GHG emissions.

#### Air Quality Impacts

The airshed in the Proposed Action area (western counties) is currently designated as attainment for all criteria pollutants. The attainment status for pollutants in the project area is determined by monitoring levels of criteria pollutants for which NAAQS and CAAQS apply. The attainment designation means that no violations of any ambient air quality standard have been documented in the area. The airshed around the Proposed Action area is also identified as a Class II airshed, which allows for reasonable economic growth. Table 6 provides a listing of the most recently available air pollutant emissions inventory compiled by CDPHE for the Delta and Gunnison county emissions sources. Table 7 below provides air pollutant emissions totals from the region for comparison.

As previously stated, the mine is regulated by the CDPHE, which analyzed the mine's operations prior to issuing a permit to emit air pollutants. The APCD determined the standards and emissions limits the mine would need to adhere to so that its activities would not adversely impact air quality. The BLM has no regulatory authority for air quality within the state, and thus to meet the mandate to protect air quality under the FLPMA, the BLM relies upon the APCD's analysis and expertise for such matters in justifying the appropriateness of the EA for this action.

**Table 6**  
**Delta and Gunnison County Emissions Inventory (CDPHE, 2008)**

Source Type	Inventory Pollutants									
	CO		NO <sub>2</sub>		SO <sub>2</sub>		PM <sub>10</sub>		VOC	
	Gunnison	Delta	Gunnison	Delta	Gunnison	Delta	Gunnison	Delta	Gunnison	Delta
Vehicles:	3,830.83	5,027.39	537.35	745.32	3.95	5.80	21.50	30.95	365.69	461.62
Road Dust:	ND	ND	ND	ND	ND	ND	1,229.75	961.00	ND	ND
Non-Road:	2,097.71	1,206.47	275.42	248.62	0.84	0.77	39.32	27.57	664.81	270.94
Wood burning:	1,115.69	2,254.55	15.09	30.50	2.34	4.73	154.58	312.36	215.74	435.96
Point Source:	38.06	0.86	36.05	6.09	0.92	0.19	215.46	378.17	60.71	17.27
Railroad:	8.22	22.14	83.43	224.75	4.75	12.80	2.07	5.58	3.11	8.37
Aircraft:	121.58	288.03	4.17	1.56	0.48	0.24	2.33	5.67	9.39	27.07
Forest/Ag. Fires:	3,389.85	1,051.06	89.51	34.90	28.64	7.88	469.02	130.29	218.40	61.39
Solvents:	ND	ND	ND	ND	ND	ND	ND	ND	57.25	116.38
Agricultural Tilling:	ND	ND	ND	ND	ND	ND	0.79	270.88	ND	ND
Structure Fires:	0.93	1.91	0.02	0.04	ND	ND	0.17	0.34	0.17	0.35
Surface Coating:	ND	ND	ND	ND	ND	ND	ND	ND	52.22	89.46
Restaurants:	1.44	2.94	0.01	0.02	0.01	0.02	3.88	7.93	3.59	7.33
Biogenic:	2,681.08	2,040.81	192.99	232.53	ND	ND	ND	ND	20,474.30	16,546.90
Oil Gas Point:	131.56	ND	147.24	ND	0.07	ND	0.97	ND	84.79	ND
Oil Gas Area:	23.23	4.97	20.36	0.11	0.44	ND	2.21	367.98	54.92	0.57
Combustion:	29.73	231.14	19.55	47.37	1.82	15.18	0.62	0.00	1.81	9.91
Tank Trucks:	ND	ND	ND	ND	ND	ND	ND	ND	0.29	0.33
Refueling:	ND	ND	ND	ND	ND	ND	ND	ND	10.77	14.55
Portables:	ND	ND	ND	ND	ND	ND	ND	ND	15.03	10.49
Construction:	ND	ND	ND	ND	ND	ND	400.97	ND	ND	ND
Pesticides:	ND	ND	ND	ND	ND	ND	ND	ND	13.48	27.52
<b>Totals (tons):</b>	<b>13,469.91</b>	<b>12,132.27</b>	<b>1,421.20</b>	<b>1,571.84</b>	<b>44.28</b>	<b>47.61</b>	<b>2,543.65</b>	<b>2,498.73</b>	<b>22,306.46</b>	<b>18,106.41</b>

ND = No Data

**Table 7**  
**Mesa County Emissions Inventory (tons), Total Emissions (CDPHE, 2008)<sup>1</sup>**

CO	NO <sub>2</sub>	SO <sub>2</sub>	PM <sub>10</sub>	VOC
40,688	9,048	2,879	8,050	39,828

<sup>1</sup> Provided for illustration purposes only.

**Pollutant Monitoring.** Grand Junction is the only large city in the area, and the only location that monitors for CO and air toxics on the western slope. In 2008, Rifle, Palisade, and Cortez began monitoring for ozone. The other western county locations monitor only for particulates. They are located in Delta, Durango, Parachute, and Telluride. Currently, there are four gaseous pollutant monitors and 11 particulate monitors in the western counties area (see Tables 8 and 9). There are one CO, three O<sub>3</sub>, eight PM<sub>10</sub>, and three PM<sub>2.5</sub> monitoring sites. PM<sub>10</sub> data have been collected in Colorado since 1985; however, the samplers were modified in 1987 to conform to the requirements of the new standard. Therefore, available trend data is only valid back to 1987. Since 1988, the state has had at least one monitor exceed the level of the 24-hour PM<sub>10</sub> standard (150µg/m<sup>3</sup>) every year except 2004. Monitoring for PM<sub>2.5</sub> in Colorado began with the establishment of sites in Denver, Grand Junction, Steamboat Springs, Colorado Springs, Greeley, Fort Collins, Platteville, Boulder, Longmont, and Elbert County in 1999. Additional sites were established nearly every month until full implementation of the base network was achieved in July of 1999. In 2004, there were 20 PM<sub>2.5</sub> monitoring sites in Colorado. Thirteen of the 20 sites were selected based on the population of the metropolitan statistical areas. This is a federal selection criterion that was developed to protect the public health in the highest population centers. In addition, there were seven special-purpose monitoring (SPM) sites. These sites were selected due to historically elevated concentrations of PM<sub>10</sub> or because citizens or local governments had concerns of possible high PM<sub>2.5</sub> concentrations in their communities. All SPM sites were removed as of December 31, 2006 due to the low concentrations of PM<sub>2.5</sub> measured and a lack of funding.

**Table 8  
Western County Gaseous, Particulate, and Meteorological Monitors in Operation for 2010**

County	Location	CO	SO <sub>2</sub>	NO <sub>x</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	Met
Delta	Delta - Health Dept 560 Dodge St.					X3		
Garfield	Rifle - Health Dept 195 W. 14th Ave.				X			
	Rifle - Henry Building 144 E. 3					X3 / H	H	
	Parachute - Elem. School 100 E. 2					X3		
La Plata	Durango - River City Hall 1235 Camino del Rio					X3		
Mesa	Grand Junction - Pitkin 645¼ Pitkin Ave.	X				H		X
	Grand Junction - Powell 650 South Ave.					X3	X3 / H	
	Palisade Water Treatment 865 Rapid Creek Rd.				X			X
	Clifton - Hwy. 141 & D Rd.					X3		
Montezuma	Cortez - Health Dept 106 W. North Ave.				X		X6	
San Miguel	Telluride - 333 W. Colorado Ave.					X3		

(Xn) – Filter Sample Continued; n=frequency in days, (H) – Hourly particulate

Because the Bowie No. 2 Mine is primarily a source of PM<sub>10</sub> emissions, only the recent monitoring data for particulate matter is shown in Table 9. The regional monitoring data for both ozone and carbon monoxide suggests the air quality at the monitored locations is attaining the national standards. More so than other pollutants, PM<sub>10</sub> is a localized pollutant where concentrations vary considerably. Thus, local averages and maximum concentrations of PM<sub>10</sub> are more meaningful than averages covering large regions or the entire state. The data is presented for qualitative purposes only.

**Table 9 ( $\mu\text{g}/\text{m}^3$ )  
Western County Monitored Particulate Matter Values for NAAQS (2010)**

County	Location	PM <sub>10</sub>			PM <sub>2.5</sub>	
		Annual <sup>1</sup>	24 Hour	3 Yr. Ave. Ex.	Annual	24 Hour
Delta	Delta - Health Dept 560 Dodge St.	21.4	51	0	ND	ND
Garfield	Rifle - Henry Building 144 E. 3	20.5	54	0	ND	ND
	Parachute - Elem. School 100 E. 2	21.3	96	0	ND	ND
La Plata	Durango - River City Hall 1235 Camino del Rio	18.1	51	1.3	ND	ND
Mesa	Grand Junction - Pitkin 645¼ Pitkin Ave.	23.0	90	0	ND	ND
	Grand Junction - Powell 650 South Ave.	18.6	41	0	8.6	33.5
	Clifton - Hwy. 141 & D Rd.	19.9	60	0	ND	ND
Montezuma	Cortez - Health Dept 106 W. North Ave.	ND	ND	ND	6.3	14.4
San Miguel	Telluride - 333 W. Colorado Ave.	19.9	354	3.1	ND	ND

<sup>1</sup> Annual standard rescinded, ND = No Data

Although the data shown above were not collected in the immediate vicinity of the mine, they indicate that PM<sub>10</sub> standards are presently being met in the region. Table 10 shows available monitoring data from surrounding counties for other criteria pollutants. These also data show that ambient air quality standards are being met.

**Table 10  
County Monitoring Data (2012)**

County	NO2 98th Percentile 1-hr (ppb)	Ozone 2nd Max 1-hr (ppm)	Ozone 4th Max 8-hr (ppm)	PM <sub>2.5</sub> 98th Percentile 24-hr ( $\mu\text{g}/\text{m}^3$ )	PM <sub>2.5</sub> Weighted Mean 24-hr ( $\mu\text{g}/\text{m}^3$ )	PM10 2nd Max 24-hr ( $\mu\text{g}/\text{m}^3$ )	PM10 Mean 24-hr ( $\mu\text{g}/\text{m}^3$ )
Delta	.	.	.	.	.	58	24
Garfield	.	0.08	0.068	.	.	46	19
Gunnison	.	0.08	0.066	.	.	72	20
La Plata	29	0.08	0.069	10	4.3	59	19
Mesa	.	0.08	0.071	24	7.3	143	23
Montezuma	.	0.08	0.068	12	5.6	.	.
Rio Blanco	19	0.08	0.069	25	9.9	.	.
San Miguel	.	.	.	.	.	68	17

source: [http://www.epa.gov/airdata/ad\\_rep\\_con.html](http://www.epa.gov/airdata/ad_rep_con.html)

The available PM<sub>2.5</sub> monitoring data indicate that the region is in attainment with the standards. Most of the mine's direct particulate matter emissions result from coal handling operations, including moving and loading of coal, coal washing and preparation, and so on. Particulate matter emissions from these types of activities are generally not in the fine fraction (that is, they are larger than 2.5 microns in size). The mine also does not emit large quantities of nitrogen oxide or sulfur dioxide gases, which can be converted in the atmosphere into fine particulate matter. The mine is thus not a large source of PM<sub>2.5</sub> and is not required by the state to obtain a PM<sub>2.5</sub> emissions permit. Particulate emissions are not expected to increase under the Proposed Action because the rate of mining will not increase. The mine is thus not expected to cause or contribute to a violation of the PM<sub>2.5</sub> standards.

**Potential Impacts Analysis for Criteria Pollutants.** A detailed air quality assessment, including modeling, of the Bowie No. 2 Mine was conducted as part of the environmental analysis in the North Fork Coal EIS (USFS and BLM, 2000). In this Final EIS (FEIS), an air quality assessment was completed for the Bowie No. 2 Mine, which is permitted by the state to produce up to 5.0 million tons of coal and coal-refuse annually. The Proposed Action analyzed in this EA assumes an expansion of the Bowie No. 2 Mine and that mining operations would continue in the lease tract. That is, the action would not constitute adding additional production to previously authorized limits or increasing mining intensity.

The air quality analysis conducted for the North Fork Coal EIS included an emissions inventory and modeling analysis that covered all three active coal mines in the North Fork Valley (Bowie No. 2, Elk Creek, and West Elk) and other related emission sources. That emissions inventory quantified PM<sub>10</sub>, NO<sub>x</sub>, and SO<sub>2</sub> emissions. The modeling analysis also included a visibility impacts assessment in the West Elk Wilderness Area as well as an atmospheric deposition impacts assessment. Emissions that were calculated and modeled included tailpipe emissions from mining equipment, haul trucks, and locomotives (railway emissions). The results of that detailed impact assessment predicted no significant impacts to air quality as a result of authorizing the mines. Further, the CDPHE in authorizing the mines permits evaluates the pollutants with significant impact levels (SIL) above their modeling criteria to ensure the mines operations will not violate the states air quality standards. It is therefore reasonable to conclude that the mines operations are within tolerable impacts to air quality based on the CDPHE's analysis and subsequent approval of the mine's permits.

It is assumed that the equipment that would be used for mining operations within the LBA tract would be the same equipment that is being used in the current mining operations. Therefore, the air quality impacts associated with the LBA tract can be presumed to be equal to, or less than, impacts predicted in the original air quality impact assessment. The air quality assessment for this EA tiers to that original assessment. Additionally, given the age of the original assessment, and the useful life of most of the equipment, it can be reasonably expected that some of the equipment has been replaced by newer models, which would have the effect of reducing equipment emissions based on the regulatory requirements placed on newer non-road engines.

As related to railway emissions, due to more stringent regulations since the North Fork Coal EIS was written, the EPA predicted that, on a nationwide average, NO<sub>x</sub> emissions from locomotives in the year 2010 would be about 40 percent less than emissions compared to 1999 levels (USFS and BLM, 2000 page 3-7). The North Fork Coal EIS air quality impact analysis, which relied on emissions factors for 1999, determined NO<sub>x</sub> emissions to be insignificant and thus current NO<sub>x</sub> emissions resulting from trains hauling coal are expected to be no higher than the previously modeled levels.

With respect to potential ozone formation, the county level analysis of the emissions inventory suggests the region is potentially NO<sub>x</sub> limited. Therefore, to effectively limit any potential for ozone formation due to area emissions, controls should focus on controlling NO<sub>x</sub> emissions. The Bowie No. 2 Mine is not a significant source of NO<sub>x</sub> and VOC emissions (the photochemical reactivity potential of methane in the troposphere is considered negligible [40

CFR 51.100(s)] and therefore operations at the mine are not expected to contribute significantly to any regional ozone formation potential.

With respect to the facility's emissions in the regional context, emissions of criteria pollutants from the Bowie No. 2 Mine are not presently causing or contributing to any violations of national ambient air quality standards, should not increase above current levels, and therefore should not result in any additional impacts on existing ambient air quality in the area.

**Potential Impacts Analysis for Greenhouse Gas Pollutants.** 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, site or regional specific impact assessment of projects related 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 environmental assessment within this air quality section is limited to accounting for GHG emissions changes that would contribute incrementally to climate change and to disclose the anticipated changes forecasted for the region based on the global models.

Methane associated with coal seams and the surrounding rock would be liberated during the mining process, as well as during the subsequent fracturing of the overburden, which occurs as the gob area (the portion of coal panels that have already been mined) is allowed to collapse. In order to protect the health and safety of miners working underground, explosive gases would be removed from the mine via a ventilation system as well as through MDWs drilled into the gob area. MDWs would be drilled to about 10 to 50 feet above the target coal seam about 1 year before mining operations begin. As the longwall mining passes under the MDW, the strata around the MDW would fracture and liberate methane. MDWs would actively pump mine atmosphere (including methane) to the surface. The MDW pumps are fueled by methane from the gob. The process of fracturing and liberation of methane would continue as the mined area collapses behind the mining operation, and the MDWs continue to pump methane from the gob. Both the ventilation system and the MDWs would release methane directly into the atmosphere. This would result in varying levels of methane release, based upon the relative concentration of methane in the mine air and overburden. Because methane emission rates are roughly correlated with coal production rates, and because coal production from the Bowie No. 2 Mine is expected to be consistent with current production rates, the rate of methane emission is not expected to differ greatly from current emission rates.

Bowie has provided methane emissions estimates for releases through mine ventilation and from the MDWs. Mine ventilation currently liberates 2,710,000 cubic feet of methane per day based on mine exhaust monitoring. MDWs are estimated to release a total of 504,000 cubic feet of methane per day. Based upon the Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2008 (EPA Publication 430-R-10-006), April 15, 2010, total coal mining related methane emissions in 2008 were 6.76 tg (teragrams=one million metric tons), and total GHG emissions were 6,956.8 tg CO<sub>2</sub> equivalent. At the Bowie No. 2 Mine, the total release of (2,710,000 + 504,000=) 3,214,000 cubic feet CH<sub>4</sub> per day is the equivalent of 474,464 metric tons per year or

0.0068 percent of the total calculated CO<sub>2</sub> equivalent emissions (6,957) for the U.S. in 2008. Based upon this analysis of mine-vented methane emissions, the calculated GHG emissions associated with the Proposed Action are negligible relative to any potential impacts on the global scale. If the calculated GHG emissions were compared with the global figures (2005 CO<sub>2</sub> equivalent emissions of 26,544 tg, World Development Report 2010: Development and Climate Change, World Bank, 2010), the relative significance of the impact to the global climate would further decrease.

Implementation of the Proposed Action would be estimated to contribute 0.474 mm metric tons of GHG equivalent annually (based on the methane releases), or about 0.0068 percent of total U.S. global contribution. 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, determining 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. The degree to which any observable changes can, or would, be attributable to the Proposed Action cannot be reasonably predicted at this time.

### **Cumulative Impacts**

The cumulative impacts to air quality in the area would primarily result in emissions of particulate matter from current and future mining of coal. Mining activities related to air emissions are permitted by the APCD of the CDPHE. The State imposes permitting limits and control measures in order to limit emissions of NAAQS pollutants. The State develops air quality attainment and maintenance plans in order to keep Colorado in compliance with the federal NAAQS.

A detailed air quality assessment, including modeling, of the original mine was conducted as part of the environmental analysis for the North Fork Coal EIS (USFS and BLM, 2000). The APCD also ensures limits are consistent with the NAAQS by requiring air quality modeling where appropriate.

The air quality analysis conducted for the mine included an emissions inventory and modeling analysis. That emissions inventory quantifies PM<sub>10</sub>, NO<sub>x</sub>, and SO<sub>2</sub> emissions. The modeling analysis also includes a visibility impacts assessment in the West Elk Wilderness Area as well as an atmospheric deposition impacts assessment. Emissions that were calculated and modeled included tailpipe emissions from mining equipment, haul trucks, and locomotives (railway emissions). The results of that detailed impact assessment predicted no significant impacts to air quality as a result of Bowie No. 2 Mine operations.

The proposed lease area would retain the current coal production rate of 5.0 million tons, and the emissions generating equipment used is assumed to be slightly newer than equipment analyzed for the operation in 2000. Therefore, cumulative impacts are not anticipated to exceed NAAQS, or to push the region into non-attainment for any NAAQS, and would result in no net change and the air quality impacts associated with the LBA tract can be presumed to be equal to, or less than, impacts predicted in the original air quality impact assessment.

The BLM estimated the amount of GHG emissions that could be attributed to coal production as a result of the proposed lease, as well as from the forecast coal production from all three coal mines in the North Fork Valley.

Coal production for the operating mines in the North Fork Valley are reported to produce the following emissions of CO<sub>2</sub>e:

- Coal production and methane liberation at the Bowie No. 2 Mine 474,464 metric tons of CO<sub>2</sub> equivalent released per year based on on-going mine activities.
- Coal Production and methane liberation at the Elk Creek Mine (Oxbow) 1,200,000 tons of CO<sub>2</sub> equivalent released per year based on on-going mine activities.
- Coal Production and methane liberation from the West Elk Mine 1,230,000 tons of CO<sub>2</sub> equivalent released per year based on on-going mine activities.

The BLM assumed that the majority of the coal was used for coal-fired electric generation as part of the total U.S. use of coal for electric generation. Policies regulating specific levels of significance have not yet been established for GHG emissions. Given the state of the science, it is not possible to associate specific actions with the specific global impacts such as potential climate effects. Because there are no tools available to quantify incremental climate changes associated with these GHG emissions, the analysis cannot reach conclusions as to the extent or significance of the emissions on global climate. The potential impacts of climate change represent the cumulative aggregation of all worldwide GHG emissions.

**Climate Change.** Coal production rates would not increase under the Proposed Action. Continued mining, operation of mine surface facilities, and associated vehicle traffic, would result in continued minor cumulative contributions to the release of GHGs into the atmosphere. The mining, processing, and shipping of coal from the Bowie No. 2 Mine, and from other mines in the area, would contribute to GHG emissions through carbon fuels used in mining (including fuel consumed by heavy equipment and stationary machinery), electricity used on site, methane released from mined coal, and rail transport of the coal. The use of the coal after it is mined has not been determined at this time; however, almost all of the coal that would be mined from the Bowie No. 2 Mine would be used by coal-fired power plants in order to generate electricity. This also results in the production of GHGs. The proposed lease would make an additional area of the coal seam that is being mined available for mining, and would extend the life of mine by approximately 16 to 18 months. Coal production would be consistent with current production rates. Release of GHGs would remain about the same as current rates.

With respect to GHG emissions, the following projections were identified by the EPA for the Mountain West and Great Plains region:

- The region could experience warmer temperatures with less snowfall.
- Temperatures are expected to increase more in winter than in summer, more at night than in the day, and more in the mountains than at lower elevations.
- Earlier snowmelt means that peak stream flow will be earlier, weeks before the peak needs of ranchers, farmers, recreationalist, and others. In late summer, rivers, lakes, and reservoirs will be drier.

- More frequent, more severe, and possibly longer-lasting droughts will occur.
- Crop and livestock production patterns could shift northward; less soil moisture due to increased evaporation may increase irrigation needs.
- Drier conditions will reduce the range and health of ponderosa and lodge pole pine forests, and increase the susceptibility to fire.
- Grasslands and rangelands could expand into previously forested areas.
- Ecosystems will be stressed and wildlife such as the mountain lion, black bear, long-nose sucker, marten, and bald eagle could be further stressed.

If these projections are realized, there would be impacts to resources within the region. For example, if global climate change results in a warmer and drier climate, increased particulate matter impacts could occur due to increased windblown dust from drier and more erodible soils. Warmer temperatures with decreased snowfall could have an impact on a particular plants ability to sustain itself within its current range. An increased length of growing season in higher elevations could lead to a corresponding variation in vegetation and change in species composition. These types of changes would be most significant for special status plants and wildlife that typically occupy a very specific ecological niche. Cool season plant species' spatial ranges are predicted to move northward or to higher elevations, and extinction of endemic threatened or endangered plants may be accelerated. Invasive plant species would be more likely to out-compete native species.

Increases in winter temperatures in the mountains could have impacts on traditional big game migration patterns. Due to loss of habitat, or due to competition from other species whose ranges may shift northward or to higher elevations, the population of some animal species may be reduced. Warmer winters with less snow would impact the Canada lynx by removing a competitive advantage they have over other predators. Earlier snowmelt could also have impacts on cold water fish species that occupy streams throughout the planning area. Climate change could affect seasonal frequency of flooding and alteration of floodplains, which could impact riparian conditions. More frequent and severe droughts would have impacts on many wildlife species throughout the region as well as vegetative composition and availability of livestock forage in some areas. Climate change could lengthen the growing season within the region, however, a longer growing season in theory would result in more forage production provided there is sufficient precipitation or it could lead to a change in dominant vegetation type. This could leave these forests and woodlands more susceptible to insect damage and at higher risk of catastrophic wildfires. Increased fire activity and intensity would increase greenhouse gas emissions.

## **Minimization Measures**

### Criteria Pollutant Emissions

To reduce particulate matter/fugitive dust emissions during construction and ongoing production activities:

- Most coal transfer points and processing activities during coal production have been enclosed and, therefore, limit dust.

- The mine will continue to comply with their APCD-issued air emissions permit provisions, and any other regulatory requirements the facility is subject to now or in the future.

### Greenhouse Gas Emissions

With regard to production activities at the mine, methane liberation from the mine may be reduced through mine planning and sealing previously mined areas.

### **Stipulations**

In addition to adherence to authorized air permits, the BLM and the USFS would require the following stipulations:

- Fugitive emissions from all vehicles traveling on regularly-used non-paved surfaces during all project phases shall be controlled utilizing a variety of suppression techniques applied to the non-paved roads.
- Storage piles shall be watered or covered as necessary to limit wind erosion potential and reduce fugitive emissions.

### **No Action Alternative**

Under the No Action Alternative, mining of the coal lease tract would not be permitted because the lease would not be issued. Current levels of methane liberation and emissions associated with the existing mine plan would continue until mining is completed. The facility would continue to comply with their APCD-issued air emissions permit provisions and any other regulatory requirements the facility is subject to now or in the near future. Methane emissions associated with proposed mining of the LBA tract would not occur.

## **WILD AND SCENIC RIVERS**

### **Affected Environment**

For Wild and Scenic Rivers, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

The BLM inventoried area streams and rivers in 2006 as part of the evaluation of Wild and Scenic Rivers (WSR) in the UFO. In June 2010, the Final Wild and Scenic Eligibility Report for the Uncompahgre Planning Area was released (BLM, 2010). A 1.21-mile segment of the West Fork of Terror Creek was determined eligible for inclusion in the National Wild and Scenic River System (NWSRS). Of the 1.21 miles that are eligible, only 0.64 mile is within the LBA tract; 0.76 mile is on private surface and 0.18 mile is on BLM surface (see Figure 3).

The following portions of the proposed lease are within the ½ mile river study corridor of the eligible river segment. There are BLM surface lands and private surface with the subsurface minerals managed by BLM.

Township 13 South, Range 91 West, 6<sup>th</sup> P.M., Section 5: W/2W/2SENE – approximately 10 acres



Congress enacted the Wild and Scenic Rivers Act (WSRA) (Public Law 90-542; 16 U.S.C. 1271 et seq.) on October 2, 1968 to address the need for a national system of river protection. The legislation was the outgrowth of a nationwide conservation movement that took place during the 1950s and 1960s, as well as a response to the numerous diversion projects and dams constructed along American waterways during the 1930s through 1960s. The WSRA stipulates that the free-flowing condition, water quality, and outstandingly remarkable values (ORVs) of selected waterways should be preserved and protected for the benefit and enjoyment of present and future generations.

As part of the revision of the UFO RMP (ongoing), the BLM was required by WSRA to inventory its rivers and streams to determine their eligibility for inclusion in the NWSRS. The study and designation of watercourses under the WSRA consists of a multi-step process: eligibility → suitability → congressional action. In order to be determined as eligible, they must be free-flowing and possess one or more ORV. The West Fork Terror Creek segment is free-flowing as defined by the WSRA, and possesses a fish ORV (greenback cutthroat trout - see the Threatened, Endangered and Sensitive Species section).

The BLM is currently drafting a suitability report that determines which segments, from among the eligible segments, are suitable for protection under the WSRA. Until that report is finalized, the BLM manages eligible segments under interim protections. Specifically, interim protections include protection of the free-flow of the stream, water quality, and the ORV so as to prevent the segment from losing its eligibility, and to keep the “scenic” classification from degrading to “recreational.”

From the Final Wild and Scenic River Eligibility Report for the Uncompahgre Planning Area (June 2010):

**Description:** The West Fork of Terror Creek is a perennial headwater stream on the southern flank of Grand Mesa north of Paonia. The creek drains into Terror Creek, which is a tributary of the North Fork of the Gunnison River. The lower terminus of this river segment is its confluence with East Terror Creek, while the upper terminus is the boundary of Grand Mesa National Forest.

**Outstandingly Remarkable Values: Fish**

Fish - Based upon the best available genetic information, this river segment harbors a population of greenback cutthroat trout (*Oncorhynchus clarki stomias*), a species listed as threatened under the Endangered Species Act. This is one of 37 greenback populations currently identified on the west slope of Colorado.

**Preliminary Classification: Scenic**

Rationale - An unsurfaced road crosses the West Fork of Terror Creek near its confluence with Terror Creek. The remaining river channel and associated corridor are primitive and undeveloped. There is a small impoundment known as Holy Terror Reservoir, as well as Grand Mesa Canal Head Gate #4, an irrigation diversion upstream of the reach.

The Grand Mesa and Uncompahgre National Forest issued a proposed Forest Plan Revision in conjunction with the Gunnison National Forest in March 2007, which included a WSR eligibility

study. There were no watercourses adjoining the UFO boundary identified as eligible including the West Fork of Terror Creek on NFS lands.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Current plans for mining include the lands under the West Fork of Terror Creek (see Map 2). WWE conducted an analysis of potential subsidence impacts on the West Fork of Terror Creek aquatic life and water supply due to potential mining of the LBA tract (WWE, 2013a). Mining would be expected to result in a maximum subsidence of about 5.7 feet at the center, near the eastern edge, of the longwall panel with the smallest overburden thickness. This location is approximately 300 feet south of the West Fork of Terror Creek channel. Based on existing topography and geologic modeling, a maximum estimated 5.1 feet of subsidence along the West Fork of Terror Creek channel would be expected to create no more than a 1.5 percent channel slope change. Because the LBA tract generally consists of steep terrain (often in excess of 25 percent slopes), the expected change in slopes is expected to be mostly, if not completely, imperceptible without the aid of survey equipment. A change of 2 percent within the average channel slope of 5.5 percent could lead to an increase in the size of particles transported from 500 mm to 650 mm (WWE, 2013a). However, while some larger material would be mobilized following channel slope increase induced by subsidence, the overall stability of the largest particles should not be significantly compromised as a result of the slope change (WWE, 2013a). Other subsidence related impacts, such as surface cracking or water loss would not be expected to the degree that they would negatively impact the quality of the aquatic habitat of the LBA tract. Based on this analysis, adverse impacts to aquatic life would not be expected as a result of potential subsidence within the LBA tract.

WWE found that the wetted perimeter of the West Fork of Terror Creek is not expected to change noticeably following subsidence, based on the magnitude of slope changes (WWE, 2013a).

### **Cumulative Impacts**

Cumulative impacts to the inventoried segment of the West Fork of Terror Creek should be limited with possible effects from livestock grazing, recreation use, and other mineral related activity such as oil and gas development. Private lands in the area around the inventoried segment could be developed in the future and affect the segment.

### **Stipulations**

The BLM and the USFS would require the following stipulations:

- State-of-the-art mining techniques (pillar and panel widths, rate of coal development and extraction, mine method, determining angle of draw [angle between a vertical line drawn upward to the surface from the edge of the underground opening and a line drawn from the edge of the opening to the point of zero surface subsidence], etc.) shall be used to control subsidence.
- No surface developments (i.e., MDWs or access roads) shall be allowed within the ½ mile wide river study corridor (i.e., 1/4 mile wide on each side of the West Fork of Terror

Creek) on BLM lands/minerals. This stipulation will no longer apply if the eligible segment on West Fork of Terror Creek is found not suitable for inclusion in the National Wild and Scenic River System, or if suitable, if it is dropped from further consideration by Congress.

### **No Action Alternative**

Under the No Action Alternative, there would be no impacts to the West Fork of Terror Creek from leasing of the coal tract as a lease would not be issued.

## **GEOLOGY AND MINERALS**

### **Affected Environment**

For Geology and minerals, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

**General Geology.** The LBA tract is located on the lower southern slopes of the Grand Mesa, in the Paonia-Somerset coal field, which contains medium to high coal development potential deposits (USFS and BLM, 2000). It resides on Quaternary Alluvium (Holocene Soil-creep deposits and Holocene-Pleistocene colluvial deposits) and the Cretaceous Mesa Verde Formation (Junge, 1978). The Mesa Verde Formation consists of sandstone interbedded with dark gray shales, where coal beds are found in the two major members: Bowie Shale Member and Paonia Shale Member (Stewart et al., 2006).

Table 11 provides a description of the geologic resources within the LBA tract. In addition to the geologic units described below, isolated igneous intrusions, which compromise the quality of adjacent coals, are present in the vicinity (USFS and BLM, 2000). No faults are known within the LBA tract but they could be present.

The surface geology in the area is Mesa Verde on the northern tip, grading to Holocene Soil-creep deposits. The Soil-creep deposits are mixtures of sand, silt, and clay with rock fragments. These deposits are characterized by a series of small swales and ridges and are generally a sign of unstable slopes.

The Cretaceous Mesa Verde Formation is the surface unit in part and lies below the alluvium in part of the LBA tract. The Mesa Verde is the coal bearing formation in the general region and the target of mining. The top of the Mesa Verde is approximately 0 to 400 feet below the surface. Extensive burn zones exist in the Mesa Verde (Stewart et al., 2006). This is evidenced in the region where the Mesa Verde outcrops as red colored shale and can be seen along State Highway 133 (Chronic and Williams, 2002). The Mesa Verde is above the Mancos Shale which is a regionally extensive bed of marine shales ranging up to 4,000 feet in thickness (Tweto, 1979). The regional geology was described in detail in the North Fork Coal EIS (USFS and BLM, 2000).

**Table 11  
Stratigraphy of the LBA Tract**

Geologic Unit		Geologic Period	Description
Alluvium and Colluvium		Quaternary	Unconsolidated soil and rock formed by mass wasting processes or by weathering of intact bedrock.
Wasatch Formation		Tertiary	Red and buff sandstones, and mudstones deposited in alluvial floodplains and stream channels (this formation contains abundant vertebrate fossils and outcrops commonly found throughout the region).
Mesa Verde Group	Ohio Creek Member	Cretaceous	Fluvial conglomerate often used as a local stratigraphic datum.
	Barren Member		Up to 2,300 feet of interbedded sandstones, shales, siltstones, and coals deposited during the final regression of the Western Interior Seaway. Mesa Verde sandstones are common natural gas reservoirs targeted for production to the northwest in Mesa and Garfield Counties. Coal Seams A, B, and C are found near the base of the Lower Coal Member; the D- and E-Seams are found in the base of the Upper Coal Member; the F-Seam is located at the top of the Upper Coal Member. Portions of the Mesa Verde Formation, including coal seams, do not outcrop within the Proposed lease.
	Upper Coal Member		
	Lower Coal Member		
	Rollins Sandstone		
Mancos Formation			Up to 4,000 feet of marine shales (this formation does not outcrop within the Proposed lease, but is exposed west of Somerset along the North Fork of the Gunnison River).

**Geologic Hazards.** Geologic hazards are defined as potentially unstable and unstable slopes and rockfall areas. The surface geology in the LBA tract consists of primarily unconsolidated deposits of clays and silts of the Wasatch Formation intermixed with basalt boulders derived from extrusive rocks capping Grand Mesa. This material, mapped as debris flows in the area (Dunrud, 1989), is commonly stable and resistant to stream erosion and to mass-gravity movements.

The terminal points of landslide/debris flow deposits are located on the north and south edge of the West Fork of Terror Creek channel where the flow gradient begins to increase eastward (Dunrud, 1989). These deposits are visible on a detailed satellite or aerial image of the area. The northern, more extensive deposit shows no sign of recurring movement. The lower part of the southern slide, however, shows signs of renewed movement since initially deposited (since the mid-1980s during times of very high precipitation). These landslides/debris flows consist of unconsolidated basalt boulders and Wasatch clays that were re-mobilized during periods of very high precipitation.

**Other Geologic Resources.** The following oil and gas leases are present in the LBA tract:

COC-064766 – Gunnison Energy Corp – T. 13 S., R. 92 W., Section 1, Lot 4, issued on 05/10/2001, expires on 4/19/2013. Oak Mesa OG Unit agreement was terminated on 4/19/2011. According to the Colorado Oil and Gas Conservation Commission (COGCC), the lessee drilled a wildcat well in 2003 and it was shut in until August 2006 when it was plugged and abandoned.

COC-065537 – Gunnison Energy Corp - T. 12 S., R. 91 W., sections 31 and 32, issued on 2/28/2002, lease was committed to the Iron Point OG unit on 7/27/2010. The unit lease in T. 12 S., R. 91 W. is COC-74545X - Iron Point. It expires 7/27/2015. A plan of operation and development was approved on 5/1/2012. The unit is held by producing wells in sections 12 and 25. The COGCC does not show any drilling in either Section 31 or Section 32.

Past oil and gas activity within the region has included coal-bed methane wells, shale wells, and coal mine methane wells. The wells within approximately 20 miles of the lease area include:

- 59 total wells drilled: on private surface (26), split-estate wells (13), Forest Service (20).
- 20 wells are producing and 34 are shut-in and 5 are temporarily abandoned.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

The Proposed Action could result in the production of approximately 8.02 million tons of recoverable tons of coal. There is the possibility of subsidence issues during mining by longwall techniques. Subsidence is the gradual lowering of the surface after the large rectangular blocks of coal are removed from the longwall mining panels. After coal recovery, the overburden is altered due to subsidence. Overburden thicknesses over 800 feet have been classified as having a negligible risk of surface fracturing developing. This is a conservative upper limit under normal conditions.

This analysis of subsidence is tiered to the North Fork Coal EIS (USFS and BLM, 2000) in Appendix K “Subsidence Evaluation” and in Chapter 3.2 under the analysis of Topography/Physiography. The EIS addresses the west tract which is known as the Iron Point Coal Tract and assigned tract serial number COC-61209. The EIS also provides guidance in assessing potential subsidence in the LBA. The longwall panel design, and yield, and gate road pillar design and configuration are likely to be similar to those used in the Iron Point Coal Tract. None of the underlying coal seams has been mined within the LBA tract; therefore, subsidence amounts are reported for mining in undisturbed ground.

Roof rocks primarily consisting of strong, thick sandstones of the Mesa Verde Group would cave into the mine in larger blocks than would shale roof rocks and would reduce the height of caving above the mine workings. These sandstones would generally reduce the amount of subsidence compared to shale. Sandstones at the surface would have larger displacements, and may form cracks up to 1 foot wide and 25 to 50 feet deep on steep slopes. Formation of joints and fractures on steep slopes may contribute to slope instability and susceptibility to landslides and rock falls. At overburden depths greater than 1,000 to 1,500 feet, gate road pillars would yield to the level of recompacted, caved, and broken rock in the longwall panel. This range of depths would be common within the LBA tract.

In the adjacent DRMS permit area, and carried forward into this analysis, there are three zones of expected subsidence impact. The zone of greatest subsidence impact is in areas where the overburden is between 110 and 500 feet. The zone of intermediate subsidence impact is in areas where the overburden is between 500 and 1,000 feet. The zone of minor subsidence impact is in

areas where the overburden is more than 1,000 feet. Under normal conditions, subsidence cracks do not appear likely to propagate through more than 500 feet of overburden.

The values reported in Table 12 are calculated for undisturbed areas within the LBA tract and an average D-Seam mining thickness of 12 feet and a panel width of 800 feet. On average, the maximum amount of subsidence is projected to be approximately 0.6 times the mining thickness.

**Table 12  
Anticipated Subsidence Values within the LBA Tract**

Maximum Subsidence Parameters				
Overburden Depth (feet)	Vertical Displacement (feet)	Maximum Tilt (percent)	Horizontal Tensile Strain (percent)	Horizontal Compressive Strain (percent)
100-250	7.2	21.6 – 8.6	7.2 – 2.9	7.2 – 2.9
250-500	7.2	8.6 – 4.3	2.9 – 1.4	2.6 – 1.3
500-1,000	7.2 – 6.0	4.3 – 1.8	1.4 – 0.6	1.3 – 0.7
1,000-1,500	6.0 – 4.1	1.8 – 0.8	0.6 – 0.3	0.7 – 0.5
1,500-2,000	4.1 – 2.4	0.8 – 0.4	0.3 – 0.15	0.5 – 0.3
2,000-2,500	2.4 – 1.6	0.4 – 0.2	0.15 – 0.1	0.3 – 0.15

Note: Modified from USFS and BLM, 2000.

Maximum measured vertical displacement (S) values in the Bowie No. 2 Mine range from about 6.0 to 7.5 feet in the upper B-seam above longwall panels B-10, B- 11, and B-12, where the overburden depth ranges from 600 to 1,050 feet. The greatest measured S value (7.5 feet) is located above mined panel B-11 due to yield on adjacent gate road pillars caused by mining of adjacent panels.

Overburden depths in the LBA tract for the B-seam range from about 950 feet in the southeastern portion under Terror Creek but gain overburden rather quickly, climbing out of the drainages to the north and west to 2,300 feet. Based on these data, the S values after mining is complete for the LBA tract vary depending on overburden depths from a maximum projected value of 4.2 feet in the western portion to a maximum projected value of 5.7 feet in the eastern portions. The location of this maximum projected subsidence value is located approximately 300 feet south of the West Fork of Terror Creek. Based on the information contained in the North Fork Coal EIS (USFS and BLM, 2000), and past experiences in valley, the mining is unlikely to result in detectable surface subsidence impacts.

**Geologic Hazards.** Generally, potential geologic hazards include landslides, frost heaves, and seismic activity related to known or suspected active faults or mining. Landslides and rockfall represent the geologic hazards within the LBA tract. Some landslides have occurred within the area during the past 30 years (mainly as a result of higher-than-average precipitation during the 1980s). Some of these landslides occurred as reactivations of previously disturbed slopes, and some were new movements. Rockfall-prone areas occur in the western portion of the study area, as do less-extensive areas of unstable slopes.

**Other Geologic Resources.** Other mineral resources in the LBA area include existing oil and gas leasing and perhaps interest in coal bed methane. Impacts to the oil and gas resources are not expected to occur as result of the Proposed Action.

### **Cumulative Impacts**

The cumulative impacts resulting from the continued underground mining in the LBA and adjacent area would primarily be due to the removal of large amounts of coal. Subsidence would be expected to be relatively uniform over large areas. The impacts of subsidence may include lowering elevations over subsided areas. Geologic formations within the subsidence area and above the extracted coal would be fractured. Gas resources could be lost due to the venting of methane through mine operations. However, future gas production in the area could be improved due to fracturing of the rock. There may be small areas that would require stipulations in order to restore surface drainage patterns; however, the overall impacts of subsidence would be minor. Dispersed residential and other development activities would result in only localized impacts to geology, mineral resources, and paleontology. The overall cumulative impacts of these developments would be minor.

### **Stipulations**

As required by DRMS, a subsidence monitoring survey network will be added to the area if the area is mined. The following will be implemented:

- No surface occupancy would be allowed in areas of high geologic hazard or high erosion potential or slopes greater than 60 percent.
- If subsidence adversely affects surface resources in any way (including, but not limited to a documented water loss), the lessee, at their expense will be responsible to: restore stream channels, stock ponds, protect stream flow with earthwork or temporary culverts, restore affected roads, or provide other measures to repair damage or replace any surface water and/or developed groundwater source, stock pond, water conveyance facilities, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, livestock and wildlife use, or other land uses as authorized by 36 CFR 251. An appropriate augmentation plan for replacement water will be decreed prior to commencing mining activities and will consider drought conditions and the limitations of local water supplies.
- Special interdisciplinary team analysis and mitigation plans detailing construction and mitigation techniques may be required on areas where slopes range from 40-60 percent. The interdisciplinary team could include engineers, soil scientist, hydrologist, landscape architect, reclamation specialist and mining engineer.
- The operator/lessee would be required to perform adequate baseline studies to quantify existing surface and subsurface resources. Existing data can be used for baseline analyses provided that the data is adequate to locate, quantify, and demonstrate interrelationships between geology, topography, hydrogeology, and hydrology. The operator/lessee would be required to establish or amend a monitoring program to be used as a continuing record of change over time of area resources in order to assess mining induced impacts. The monitoring program shall provide the procedures and methodologies to adequately assess interrelationships between geology, topography,

hydrogeology, and hydrology identified in the baseline assessment to mining activities. The monitoring program shall incorporate baseline data so as to provide a continuing record over time.

### **No Action Alternative**

Under the No Action Alternative, there would be no project-related impacts to the geology of the area from subsidence because the lease would not be issued; however, mining on adjacent leases could have effects but they are expected to be minimal.

## **CULTURAL RESOURCES**

### **Affected Environment**

For Cultural resources the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

A Class III cultural resource inventory was conducted for the entire proposed lease area to identify any cultural resources present (Connor et al., 2012). The inventory resulted in identification and documentation of ten sites within the study area. Of these ten sites, seven had historic materials, two had prehistoric materials, and one site contained both historic and prehistoric materials. Three of the sites within the proposed lease area have been officially deemed eligible for listing on the National Register of Historic Places (NRHP) by the State Historic Preservation Officer (SHPO) so are considered historic properties. These include two historic sites and one prehistoric site. One site with prehistoric and historic materials was determined to be potentially eligible to the NRHP and so is managed as a historic property. The remaining sites were determined Not Eligible to the NRHP by the Colorado SHPO and so are not considered significant cultural resources and do not require additional management consideration.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Subsidence associated with the Proposed Action is expected to be minimal and would generally affect the area immediately overlying those areas that are mined (see Geology and Minerals). Two historic properties are located within the projected subsidence area; the remaining two significant sites would not be affected by subsidence. It has been determined that, while two historic properties are present within the projected subsidence area, it is not expected that they would be adversely affected by subsidence within the LBA tract (Lane, 2013). These sites would be monitored after project activities commence to ensure the continued integrity of both sites; if changes affecting the site are observed, stabilization or stipulations would be conducted in consultation with Tribes and Colorado SHPO.

Any post-leasing surface use would require avoidance or mitigation of the historic properties or potential historic properties within the lease tract. In addition, if any cultural resources are discovered during construction of the pads or roads, construction would stop and the BLM or USFS would be notified immediately.

## **Cumulative Impacts**

Four historic properties have been documented within the LBA area and only two of these sites are located within the projected subsidence area, which could cause effects from underground mining. None of the sites is located in outcrop areas or on steep slopes, which could harm sites as a result of pronounced effects from subsidence. No significant changes in drainage patterns, which could cause erosion to sites, are expected. Increased surface activity in the vicinity of the historic properties could lead to increased impacts to sites over a short period of time as access into the area increases, but any such impacts are expected to be minor since access roads and pads on the surface would later be reclaimed and access would be restricted during mining activities. Consequently, cumulative impacts to historic properties are expected to be minor.

## **Stipulations**

Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the FS and BLM shall:

- Contact the BLM/FS to determine if a site specific cultural resource inventory is required. If a survey is required, then:
  - Engage the services of a cultural resource specialist acceptable to the BLM/FS to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the area of proposed disturbance to cover possible site relocation which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the BLM/FS for review and approval at the time a surface disturbing plan of operation is submitted.
  - Implement mitigation measures required by the FS and BLM to preserve or avoid destruction of cultural resource values. Mitigation may include relocation of proposed facilities, testing, salvage, and recordation or other protective measures. All costs of the inventory and mitigation will be borne by the lessee or operator, and all data and materials salvaged will remain under the jurisdiction of the U.S. Government as appropriate.
- The lessee or operator shall immediately bring to the attention of the FS and BLM any cultural or paleontological resources or any other objects of scientific interest discovered as a result of surface operations under this lease, and shall leave such discoveries intact until directed to proceed by FS and BLM.

## **No Action Alternative**

Under the No Action Alternative, there would be no impacts from subsidence or mining-related surface activities to cultural resources in the proposed lease tract as leasing would not occur

## **NATIVE AMERICAN RELIGIOUS CONCERNS**

Native American religious concerns are associated with cultural practices or beliefs of a living community rooted in the history or religion of that community and are important in maintaining the continuing cultural or religious identity of the community. Consultations with tribes that historically occupied the proposed lease area did not identify any religious concerns.

## SOILS

### Affected Environment

For soil resources the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

Surface soils in the lease area are mapped in two separate reports: Soil Survey of Grand Mesa – West Elk Area, Parts of Delta, Garfield, Gunnison, Mesa and Montrose Counties and Soil Survey of Paonia Area, Parts of Delta, Gunnison, and Montrose Counties (see Map 4).

There are 15 soil mapping units (MUs) present within the LBA tract. Each of the soils is described below using reports generated from the Natural Resources Conservation Service (NRCS) Soil Data Mart SSURGO data (NRCS, 2013a, b and c). The soil types include clay, loam, clay loam, stony to very stony clay and loam, and gravelly to very gravelly clay and loam. The mapped soil units generally have moderate to severe erosion potential, with K factors ranging from 0.10 to 0.28. None of the soils has saline or sodic characteristics and none meet hydric criteria. The West Fork of Terror Creek channel in the lease area is covered by two mapped soil units: 158 Herm-Fughes-Kolob family complex with 25 to 40 percent slopes, and 39 Fughes loam with 25 to 65 percent slopes (see Map 4).

Table 13 provides the acres of each soil mapping unit within the proposed LBA area. This information is consistent with the discussion in the North Fork Land Health Assessment (LHA) (BLM, 2007). The North Fork LHA evaluated the general area as meeting Standard 1 for soils. Some potential soil protection issues related to high bare ground and low plant basal cover were noted; however, soil loss and runoff damage problems were not identified.

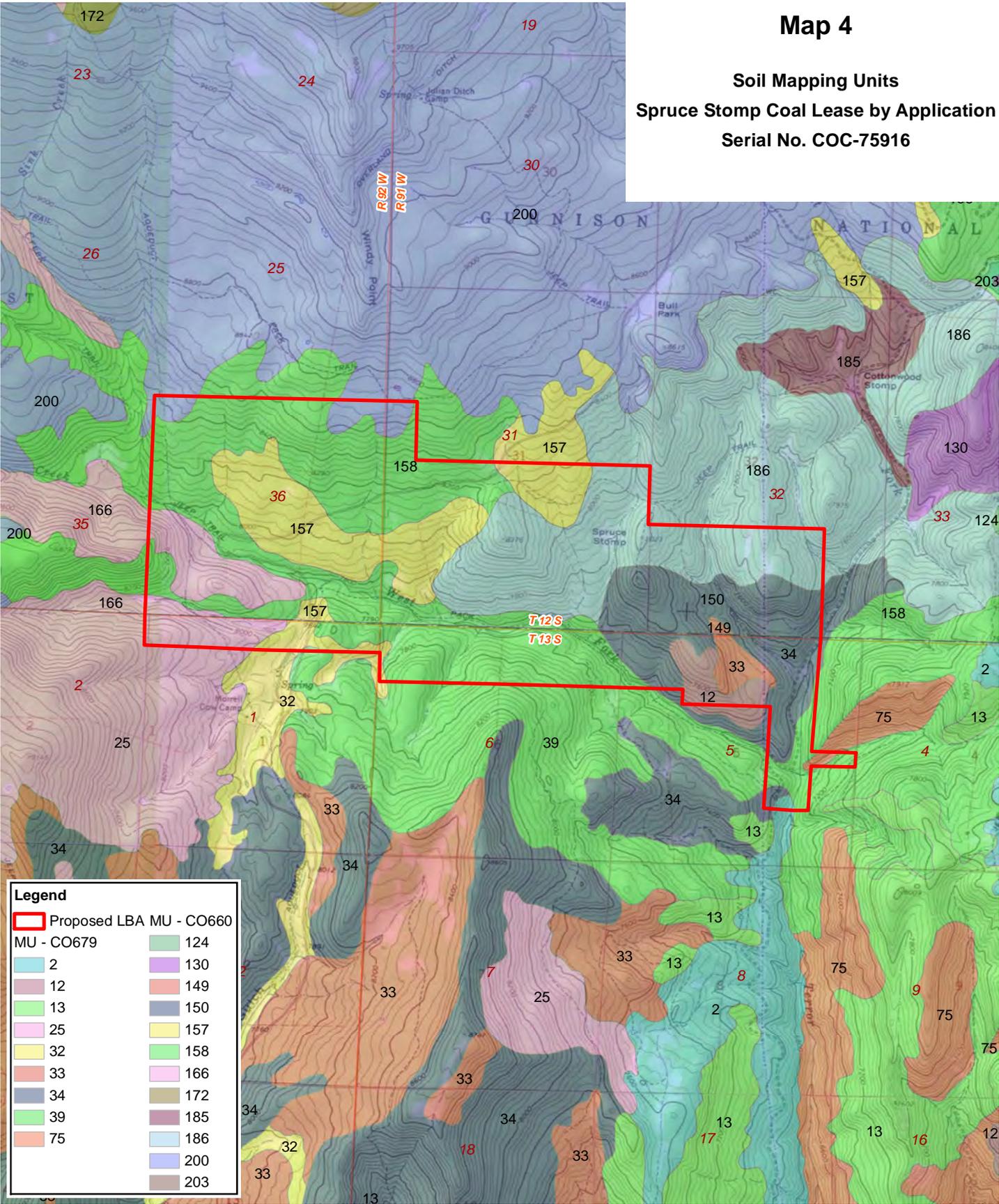
#### Soil Survey Area CO660 – Grand Mesa – West Elk Area, Colorado, Parts of Delta, Garfield, Gunnison, Mesa, and Montrose Counties

The Godding-Kolob family-Delson complex (MU149 & MU150) are well drained soils found on mesas and benches. They are derived from overburden residuum weathered from basalt and colluvium derived from basalt and/or interbedded colluvium derived from sandstone and shale. The slopes range between 5 to 65 percent. The effective rooting depth is greater than 60 inches. The Godding-Kolob component contains up to 70 percent large stones. The soil is not flooded or ponded. Susceptibility to water erosion is low to moderate.

The Herm-Fughes complex and the Herm-Fughes-Kolob family complex (MU157 and MU158) are well drained soils found on mountains. They are derived from interbedded colluvium derived from sandstone and shale and/or interbedded residuum weathered from sandstone and shale. The slopes range between 5 to 40 percent. The effective rooting depth for the Herm component is greater than 60 inches. The Fughes component has a restrictive layer of paralithic bedrock at 40-60 inches and contains up to 15 percent large stones. The Kolob component is very stony containing up to 70 percent large stones. These soils are not flooded or ponded. Susceptibility to water erosion is low to moderate.

# Map 4

## Soil Mapping Units Spruce Stomp Coal Lease by Application Serial No. COC-75916



**Legend**

<span style="border: 2px solid red; display: inline-block; width: 15px; height: 10px;"></span> Proposed LBA MU - CO660	124
MU - CO679	130
2	149
12	150
13	157
25	158
32	166
33	172
34	185
39	186
75	200
	203

No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM



**Table 13**  
**Summary of Soil Resources within the LBA Tract**

<b>Soil Mapping Unit</b>	<b>Acres in the Proposed Lease</b>	<b>Percent of the Proposed Lease</b>	<b>Hazard of Erosion</b>	<b>Rutting Hazard</b>
<b>Grand Mesa – West Elk Area, Colorado, Parts of Delta, Garfield, Gunnison, Mesa, and Montrose Counties (CO660)</b>				
Godding-Kolob family-Delson complex (MU149), 5 to 25 percent slopes	2.83	0.16	Moderate to severe – slope erodibility	Slight to Severe– low strength
Godding-Kolob family-Delson complex (MU150), 25 to 65 percent slopes	139.71	7.81	Severe – slope erodibility	Severe – low strength
Herm-Fughes complex (MU157), 5 to 25 percent slopes	252.35	14.10	Moderate to severe – slope erodibility	Severe – low strength
Herm-Fughes-Kolob family complex (MU158), 25 to 40 percent slopes	462.59	25.85	Severe – slope erodibility	Severe – low strength
Leroux-Seitz complex (MU166), 5 to 40 percent slopes	91.78	5.13	Moderate to severe – slope erodibility	Severe – low strength
Shawa-Sandia family-Kolob family complex (MU186), 40 to 65 percent slopes	348.44	19.48	Severe – slope erodibility	Severe – low strength
Wetopa-Wesdy complex (MU200), 5 to 65 percent slopes	37.95	2.12	Severe – slope erodibility	Severe to Moderate– low strength
<b>Paonia Area, Colorado, Parts of Delta, Gunnison, and Montrose Counties (CO679)</b>				
Absarokee-Work Loams (MU2), 6 to 25 percent slope	2.80	0.16	Severe – slope erodibility	Severe – low strength
Beenon-Absarokee loams (MU12) 5 to 20 percent slope	36.15	2.02	Moderate to severe – slope erodibility	Severe – low strength
Cochetopa stony loam (MU 25) 10 to 40 percent slope	45.90	2.57	Moderate – slope erodibility	Moderate – low strength
Delson loam (MU 32) 3 to 12 percent slope	24.30	1.36	Moderate – slope erodibility	Severe – low strength
Delson stony loam (MU33) 3 to 20 percent slope	24.85	1.39	Moderate – slope erodibility	Severe – low strength
Delson very stony loam (MU34) 20 to 60 percent slope	108.49	6.06	Severe – slope erodibility	Moderate – low strength
Fughes loam (MU39) 25 to 65 percent slope	207.17	11.58	Severe – slope erodibility	Severe – low strength
Torriorthents-Rock outcrop, sandstone complex (MU75)	3.89	0.21	Severe – slope erodibility	Slight – strength
<b>Total</b>	<b>1,789.20</b>	<b>100</b>		

The Leroux-Seitz complex (MU166) are moderately to well drained soils found on valleys and mountains. They are derived from residuum weathered from basalt and/or interbedded residuum weathered from sandstone and shale and/or colluvium derived from basalt and/or interbedded colluvium derived from sandstone and shale. Slopes range from 5 to 40 percent. The soil is not flooded or ponded; however, a seasonal zone of water saturation in the Leroux component is at 30 inches during April, May, June, and July.

The Shawa-Sandia family-Kolob family complex (MU186) are well drained soils found on mountain slopes and benches. They are derived from interbedded residuum weathered from sandstone and shale and/or interbedded colluvium derived from sandstone and shale. The slopes range from 40 to 65 percent. The Sandia soil has a restrictive layer of paralithic bedrock at 40 to 60 inches. The Kolob component is very stony containing up to 70 percent large stones. This mapping unit is not flooded or ponded.

The Wetopa-Wesdy complex (MU200) are well drained soils found on mountain slopes ranging from 5 to 65 percent. They are derived from interbedded residuum weathered from sandstone and shale and/or interbedded colluvium derived from sandstone and shale. Depth to a restrictive layer is greater than 60 inches. The Wesdy soil may contain up to 45 percent large stones. These soils are not flooded or ponded.

#### Soil Survey CO6790 – Paonia Area, Colorado, Parts of Delta, Gunnison, and Montrose Counties

The Abasarokee-Work loams (MU2) are moderately deep, well drained soils found on valley sides and uplands. The slopes range from 6 to 25 percent. The soils are derived from weathered sandstone. The hazard of erosion from wind is slight and from water is moderate to high. The mapping unit is not flooded or ponded. The Absarokee soil has a restrictive layer of lithic bedrock at 20 to 40 inches and the effective rooting depth for the Work loam is greater than 60 inches.

The Beenon-Absarokee loams (MU 12) are well drained soils derived from weathered sandstone and interbedded shale. The mapping unit slopes range between 5 to 20 percent. The Beenon component is shallow and overlies bedrock at a depth of 10 to 20 inches and contains up to 25 percent large stones. The effective rooting depth is approximately 14 inches. The Absarokee loam is moderately deep, overlies bedrock at a depth of 20 to 40 inches and contains up to 15 percent large stones. The effective rooting depth is approximately 30 inches. Water erosion for this complex is moderate to high. Limiting characteristics of the mapping unit include high clay content, depth to bedrock, low organic content, and low available water content.

The Cochetopa stoney loam (MU 25) is a deep, well drained soil derived from alluvium and or complex landslide deposits and has slopes that range between 10 and 40 percent. The hazard from water erosion is moderate to high, and the effective rooting depth is greater than 60 inches. The stone content varies from areas free of stones to small areas with stone contents up to 45 percent. This mapping unit has inclusions in depressions that are considered hydric. The main limitations for construction within this soil unit are the presence of large stones, shrink-swell potential, low strength, and slope.

The Delson loams (MU32, MU33, MU34) are deep, well drained soils formed in stony outwash alluvium from igneous origin. Slopes within these three mapping units range from 0 to 60 percent, and the stone content ranges from 0 to 70 percent. The main limitations for construction within these soil units are stones, low strength, and shrink-swell potential because of the high clay content and the slopes in MU34.

The Fughes loam (MU 39) is a deep, well drained soil formed in old alluvial fan and/or complex landslide deposits. Surface runoff is rapid to very rapid and the hazard from water erosion is high. The main limitations for construction within this soil unit are high clay content, low strength, shrink-swell potential, and slope. The soil limitations within these soil mapping units could be overcome through proper engineering designs and application of appropriate reclamation procedures.

Torriorthents-Rock outcrop, sandstone complex (MU75) is a well drained soil found on moderate to steep mountain slopes ranging from 20 to 50 percent. The Torriorthents soils occur in less sloping area and are derived from stony loamy rockfall deposits. The rock escarpments commonly occur on the upper part of the slopes. Depth to a restrictive layer of lithic bedrock is 10 to 70 inches. Surface runoff is rapid but surface stoniness helps prevent water erosion. The soil is not flooded or ponded.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Table 13 provides the acres of each soil type within the LBA tract as well as the potential hazard for roads and rutting. If the lease and a subsequent mine plan were approved, MDW pad drilling and partial reclamation would occur over a period of several years. Topsoil from portions of the approximate 1-acre MDW drill pads to be reclaimed would be stockpiled separately from other soil horizons and used to reclaim portions of the drill pads. Topsoil salvage helps to retain microbial communities that can accelerate revegetation of disturbed areas.

The potential direct impacts resulting from MDW drilling would be:

- physical removal, mixing, or burying of surface soils;
- damage including compaction or destruction of soil properties in place;
- mixing of drilling wastes into the pad subsoil materials; and
- localized losses or decreases in vegetation cover and plant litter.

Under the reasonably foreseeable future mine plan, future MDW drill pads and access roads and their associated 45 acres of surface disturbance have the potential to result in short-term indirect impacts to soil through increased water and wind erosion. This could result in a loss of surface soil, potentially impacting the viability of vegetation communities. Soil loss during project activities would be mitigated by seeding the soil stockpiles according to BLM and USFS specifications.

Roads would be reclaimed after mining is complete and ventilation is no longer needed. The period of active use of the roads for drilling would be from a few days to a few weeks, depending

upon the number of drill pads a road would access. Reclamation would include returning disturbed areas to original contours and revegetating the disturbed areas using a USFS or BLM-approved native seed mix. Reclamation of the disturbed areas would be monitored annually until considered successful by the jurisdictional agencies.

Some subsidence is expected to occur as a result of underground activities. Some fracturing or loosening of the soil profile may occur in areas where the surface shows tensile subsidence fractures from the irregular pattern of subsidence and, to a lesser degree, some compression may result in, and near, the areas of maximum subsidence. These modifications to the soil profile could result in increased percolation of water in areas that are fractured and reduced percolation in areas that are compressed. These slight modifications to the soil profile are not expected to result in appreciable changes to the characteristics or properties of the soils.

### **Cumulative Impacts**

The cumulative impacts of continued underground mining to soils in the LBA area would primarily be the disturbance effects of future MDW surface facilities. These additional surface disturbing activities would affect the soil resource by displacing soils at specific locations. The topsoil and subsoil is stockpiled and reserved for reclamation. Contemporaneous reclamation techniques would be used, thus replacing/re-using the soils on the site as soon as the location is no longer needed.

The area around the LBA contains numerous existing natural landslides and other unstable areas. These natural features when combined with surface disturbing activities and subsidence from existing and future coal mining would continue to contribute to localized increased sedimentation. In addition, if landslides and rockfalls are initiated or accelerated due to subsidence, increased sedimentation and erosion is likely to occur in those areas. Previous experience in the North Fork has demonstrated that subsidence triggered mass wasting has not been significant enough to adversely affect terrestrial and aquatic ecology.

There could be local areas of increased erosion; however, the overall impacts to soils would be minor. Oil and gas development, dispersed residential, recreation use, ATV use, and other developments would result in localized impacts to soils; however, the overall cumulative impacts of these developments would be minor.

### **Stipulations**

- None in addition to those in the Geology and Minerals and Threatened and Endangered Species sections.

### **Finding on the BLM Public Land Health Standard for Upland Soils**

The existing soil conditions meet the criteria established in the Public Land Health Standard for upland soils. As appraised in the North Fork LHA (BLM, 2007), the BLM land within the LBA tract meets LHA Standard 1 for soils; however, there are some sites noted with high bare ground and low plant basal cover in the general area. Yet, these sites had adequate litter cover and showed no soil loss or runoff drainage problems.

Currently, there are no identified serious problems with poorly located and maintained roads; however, care needs to be taken in order to monitor this situation in this steep terrain. Based upon the limited disturbance and required site reclamation, the Proposed Action would not change the existing conditions for upland soils in the LBA tract, and natural soil functions would be maintained with the applied stipulations.

### **No Action Alternative**

Under the No Action Alternative, there would be no impacts to soils within the LBA tract because the lease would not be issued. Subsidence from existing lease tracts would occur but the impacts should be minimal on the LBA tract.

## **VEGETATION**

### **Affected Environment**

For vegetation resources the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

Habitats in the project area are dominated by mountain shrub communities, primarily Gambel oak, on south-facing slopes, with aspen, spruce-fir, and grasses as the next three dominant cover types by acreage. There are smaller areas of other mountain shrubs and Douglas-fir, with very small areas of sagebrush and juniper within the lease area. Riparian habitat is dominated by blue spruce which typically contains limited populations of narrowleaf cottonwood and willows, including strapleaf, mountain or whiplash willow (USFS, 2013a). While Table 14 shows dominant cover types, there are other species and inclusions of other habitat types within the polygons of the vegetation layer in GIS, and numerous habitat types occur below the resolution of the GIS data. For instance, riparian vegetation along Terror Creek within the analysis area contains substantial strapleaf willow and other riparian vegetation which is not represented by the categorization above. The project area lies at 7,000 to 8,800 feet elevation (see Table 14).

### **Environmental Consequences/Stipulations**

#### **Proposed Action**

Under the reasonably foreseeable surface use scenario, it is assumed that approximately 45 acres of vegetation would be disturbed by project activities, of which mountain shrub and aspen forest are expected to be the vegetation types most affected. The road and pad locations have not yet been determined so the impacts of those surface activities are assumed to be proportional to the available surface vegetation proportions in the LBA tract, which would result in most disturbance occurring within mountain shrubland and aspen forest vegetation types (see Table 14).

**Table 14**  
**Vegetative Cover-types Present within Proposed LBA Tract**

<b>Vegetation Type</b>	<b>Watershed (acres)</b>	<b>Lease Area (acres)</b>	<b>Percent of Lease Area within Watershed</b>
Greasewood	1.4	0	0.0
Mountain grassland	2,130.70	93.63	5.2
Mountain shrub	5,485.30	1260.45	70.4
Bare ground (roads, rock)	287.7	41.83	2.3
Riparian	119.5	11.35	0.6
Sage	463.7	0.30	0.0
Aspen	6,002.30	226.34	12.7
Aspen forest with conifers	609.6	38.48	2.2
Cool moist mixed conifer	58.4	22.69	1.3
Spruce-fir	3,332.60	93.04	5.2
Pinyon-juniper	344.5	1.09	0.1
Water	32.9	0	0.0
<b>Total</b>	<b>18,868.70</b>	<b>1,789.20</b>	<b>100</b>

Localized, short-term disturbance (up to 2 years) to vegetation would result from the construction and use of light-use roads, as well as activities associated with the drilling of 35 MDWs (25 drill pads). During road and well pad construction and route use, vegetation would be disturbed, crushed, or removed. Indirect impacts to vegetation would include increased dust deposition and effects to the native plant community from the introduction of weeds and weedy species. MDW pads and roads would not all be built at one time. It is customary to construct pads and associated access roads in advance of the longwall position, and then restore them once the mining has progressed beyond these locations. Interim reclamation would occur after construction and drilling activities are complete to reduce the amount of bare ground associated with construction of roads.

After mine ventilation is no longer required (approximately 1 to 3 years after construction is completed), drill pads and access roads would be reclaimed, recontoured, and revegetated with native vegetation using BLM and USFS-approved seed mixes. These areas would be recontoured and revegetated with grasses and forbs for erosion control in the short term, and would revegetate to appropriate mid-seral vegetation states for each of the native vegetation types over the long term. Revegetation of areas where trees or shrubs would be disturbed would take longer (10 to 30 years) than areas where only grasses and forbs would be disturbed (2 to 5 years). Although there would be a short-term shift in species composition until native trees and shrubs become reestablished, all areas of disturbance would be reclaimed; and therefore, habitat would not be permanently removed from the landscape but would be removed in the short-term.

Mining may result in subsidence of surface topography as coal is removed from below. This subsidence has resulted in minor landslides. Such disturbance, however, has been limited to steep and unstable ground and has not been widespread in undermined areas. Most surface subsidence has been relatively uniform across the landscape and in most areas does not visibly alter surface

features or vegetation. Impacts to the vegetation community resulting from channel profile changes could occur if water availability along the riparian corridor is significantly altered or if slope instability occurs. WWE found that the wetted perimeter of the West Fork of Terror Creek is not expected to change noticeably following subsidence, based on the magnitude of slope changes (WWE, 2013a). Thus, underground activities would not be expected to impact vegetation within the LBA tract.

### **Cumulative Impacts**

Other than minor subsidence impacts and disturbance from past and future mine location exploration and MDW development, continuing mining operations in the LBA area would not greatly impact vegetation communities. Grazing is anticipated to continue, as practiced, and vegetation communities are not expected to be substantially altered by this practice. However, grazing activity as well as other multiple use programs such as recreation and hunting incrementally increases the establishment of weeds and nonnative species in the region, which will incrementally add to the loss of native plant communities across the landscape, especially for the short term. Sudden Aspen Decline (SAD) is present in the project area and throughout the watershed, though the extent has not been documented. The limited extent of surface mining activities would not be expected to adversely affect overall aspen stand health or survival. There may be local displacement of vegetation communities as a result of continued dispersed residential and timber/vegetation management activities, continued oil and gas development, recreation and ATV use. Overall, cumulative impacts to vegetation are expected to be minor, and mining operations would negligibly contribute to these impacts.

### **Stipulations**

None.

### **Finding on the BLM Public Land Health Standard for Plant and Animal Communities (partial, see also Wildlife, Aquatic; Wildlife, Terrestrial; and Invasive, Non-native Species)**

The North Fork LHA (BLM, 2007) found that the project area was generally in good condition, with a few areas with low ground cover and less plant litter than expected. Cheatgrass (*Bromus tectorum*) is present throughout the LBA tract. The problems were not identified as serious. Vegetation communities on BLM-managed lands in the LBA tract and within the existing lease areas would continue to meet Public Health Standard 3.

### **No Action Alternative**

Under the No Action Alternative, there would be no impacts to vegetation within the LBA tract because the lease would not be issued.

## **INVASIVE, NON-NATIVE SPECIES**

### **Affected Environment**

For invasive, non-native species, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

The State of Colorado maintains a list of plants that are considered to be noxious weeds and are given one of three categories that should be managed according to the Colorado Noxious Weed

Act: Category A species are not known to occur in Colorado or are very limited and should be eradicated; Category B species have varying distributions and densities and weed management plans should be designed to stop the continued spread of these species; and Category C species are widespread and common in Colorado but may be required to be controlled (Colorado Department of Agriculture, 2011). Noxious weed surveys were not conducted for the LBA tract; however, the BLM and USFS have summarized data for known noxious weed occurrences in the general project area. Yellow starthistle, the only Category A species identified, has the largest number of occurrences (see Table 15). Because roads are typically vectors for weed seeds, noxious or invasive weed species would likely be present on or adjacent to the areas that would be disturbed by drilling equipment.

**Table 15**  
**Invasive Plant Species Identified in the General Project Area**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Category</b>	<b>Number of Distinct Occurrences</b>
<i>Acroptilon repens (L.) DC.</i>	Russian knapweed	B	4
<i>Arctium minus Bernh.</i>	common burdock	C	11
<i>Cardaria draba (L.) Desv.</i>	hoary cress/whiteweed	B	1
<i>Carduus nutans L.</i>	musk thistle	B	19
<i>Centaurea diffusa Lam.</i>	diffuse knapweed	B	1
<i>Centaurea solstitialis L.</i>	yellow starthistle	A	47
<i>Cirsium arvense (L.) Scop.</i>	Canada thistle	B	33
<i>Cichorium intybus L.</i>	Chicory	C	8
<i>Cirsium vulgare (Savi) Ten.</i>	bull thistle	B	5
<i>Cynoglossum officinale L.</i>	houndstongue	B	1
<i>Lepidium latifolium L.</i>	perennial pepperweed	B	8
<i>Leucanthemum vulgare Lam.</i>	oxeye daisy	B	2
<i>Verbascum thapsus L.</i>	common mullein	C	1
<i>Lepidium latifolium</i>	tall whiteweed	B	Present
<i>Aegilops cylindrica</i>	jointed goatgrass	B	Present

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Under the assumed reasonably foreseeable surface use scenario, light-use roads and drill pads associated with MDW drilling would cause surface disturbance. Access roads would involve scratch-grading or surface preparation that could result in surface disturbance and expose areas to the establishment of noxious weeds. Where soils are disturbed and native vegetation is lost, there is a potential for invasive and non-native plant species to establish. Once established, invasive and exotic species can dominate the sites and prevent effective recovery of native species.

Reclamation of roads, as well as of each drill pad site, would include grading, scarifying, and seeding using BLM- and USFS-approved seed mixtures and application rates. Seeding would occur both as an interim control measure after construction activities are completed and as part of final reclamation, and would occur at a time when opportunities are greatest for establishment (including late summer, fall, or early spring) in order to improve germination rates. As documented with mine operations and reclamation practices in the North Fork, with the proposed stipulations, the risks of long-term noxious weed problems on the roads and MDW pads is expected to be low.

### **Cumulative Impacts**

Other than minor subsidence impacts and disturbance from past and future mine location exploration and MDW development, continuing mining operations in the LBA area would not greatly impact vegetation communities' health and create opportunities for invasive species. There may be local infestations created as a result of continued dispersed residential and forest management activities, continued oil and gas development, grazing, recreation, and ATV use. Stipulations required to control invasive species should limit the impacts from invasive species.

### **Stipulations**

Noxious weed control would be required along access routes and at drill sites, in accordance with the Colorado Noxious Weed Act. Stipulations include:

- An inventory shall be completed for noxious weeds within the LBA tract before construction begins in order to determine whether there is a need for pre-treatments (with results of the inventory shared with the USFS and BLM weed specialist).

The DRMS mining permit requires a noxious weed control plan.

### **Finding on the BLM Public Land Health Standard for Plant and Animal Communities (partial, see also Wildlife, Aquatic; Wildlife, Terrestrial; and Vegetation)**

The LBA tract meets Public Land Health Standard 3 for healthy native communities; however, some exotic invasive plant species are known to exist within the area. Precautions need to be maintained in order to minimize the spread and/or introduction of invasive, non-native species within the project area. With implementation of the stipulations, assumed surface activities would not impact the viability of plant populations or communities. Vegetation communities within the proposed lease area would continue to meet the Standard.

### **No Action Alternative**

Under the No Action Alternative, there would be no increase in the establishment and occurrence of noxious or invasive weeds within the LBA tract because the lease would not be issued.

## **THREATENED, ENDANGERED, AND SENSITIVE SPECIES**

### **Affected Environment**

The cumulative effects analysis area is defined by the expanded watershed area 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 back towards the town of Delta.

Federally threatened and endangered species are discussed in detail in the Programmatic Biological Assessment (PBA) that was conducted over a large effects area, which included the boundary of the current LBA tract (WestWater Engineering, 2011). In addition, a Biological Assessment (BA), supplementing the determinations of effect in the PBA, was completed to address subsidence impacts associated with longwall mining (WWE, 2013b). The applicable sections of the PBA and BA are summarized in this section. The USFS also prepared a Biological Evaluation (BE) specific to the project area, which included a Management Indicator Species (MIS) Assessment. Results are summarized in the appropriate sections of this document and the BE is included in the Project Record.

Informal Section 7 consultations were completed by the U.S. Fish and Wildlife Service (USFWS), Western Colorado Ecological Services Field Office on February 21, 2012, for Bowie Resources Underground Coal Mining Associated Surface Activities and Facilities and on June 27, 2013 for Longwall Coal Mining Spruce Stomp Lease Area (see Appendix E). The February 2012 informal consultation is programmatic in nature and addresses Bowie’s mining-related surface developments and provides information about the potential effects of Bowie’s action on federally-listed species included below. The June 2013 informal consultation is specific to subsidence effects associated with longwall mining. Appendix A to the February 2012 consultation document contains the BLM and USFS-required conservation measures that will be used in this and future approvals related to Bowie’s developments. These conservation measures, as well as the conservation measures from the June 2013 consultation document, are incorporated into the stipulations in this section.

The USFWS (2012) identified 12 species as endangered, threatened, or candidate under the Endangered Species Act (ESA) that may occur in Delta County (see Table 16). In addition to federally-listed species, the USFS and BLM identified 19 other species as sensitive with the potential to occur within the general area of the LBA tract (see Table 17).

**Table 16  
Federally Threatened, Endangered, or Candidate Species in Delta County**

<b>Common Name/ Scientific Name</b>	<b>Status<sup>1</sup></b>	<b>Potential Occurrence in the Analysis Area<sup>2</sup></b>	<b>Discussed in EA</b>	<b>Habitat<sup>3</sup></b>
<b>Mammals</b>				
Black-footed ferret <i>Mustela nigripes</i>	E, SE	None	No	Requires large prairie dog colonies in open habitat such as grasslands, steppe, and shrub steppe.
Canada lynx <i>Lynx Canadensis</i>	T, SE	Unlikely	Yes	Coniferous forests interspersed with thickets of trees and shrubs, rocky outcrops, large woody debris; closely associated with snowshoe hares. Present on Grand Mesa.
North American wolverine <i>Gulo gulo lucus</i>	C, SE	None	Yes	High elevation boreal and alpine habitats.
<b>Birds</b>				

<b>Common Name/ Scientific Name</b>	<b>Status<sup>1</sup></b>	<b>Potential Occurrence in the Analysis Area<sup>2</sup></b>	<b>Discussed in EA</b>	<b>Habitat<sup>3</sup></b>
Gunnison sage-grouse <i>Centrocercus minimus</i>	C, SC	None	No	Expansive sagebrush with grasses, forbs, and healthy riparian ecosystems; project outside of expected range.
(Western) Yellow-billed cuckoo <i>Coccyzus americanus</i>	C, SC	None	No	Riparian forested habitats dominated by cottonwoods. Observed on North Fork of Gunnison River (Beason, 2009).
<b>Fish</b>				
Colorado pikeminnow <i>Ptychocheilus lucius</i>	E, SE	Unlikely	Yes	Fast, deep, white-water rivers with backwater areas and eddy habitats 2 to 3 feet deep that support aquatic insects, small fish as prey species.
Greenback cutthroat trout <i>Oncorhynchus clarki stomias</i>	T, ST	Present	Yes	Cold, clear, gravely headwater streams and mountain lakes with abundant insects; originally in the Arkansas and South Platte river drainages of Colorado and Wyoming. Recent genetic testing indicates populations exist in the Colorado River drainage.
Razorback sucker <i>Xyrauchen texanus</i>	E, ST	Unlikely	Yes	Slow backwater habitats or large rivers and impoundments, not small tributaries or headwaters, with mud, sand or gravel substrate.
<b>Plants</b>				
Clay-loving wild buckwheat <i>Eriogonum pelinophilum</i>	E, SE	None	No	Restricted to the badlands/Adobe Hills east of Delta and Montrose, CO.
Colorado hookless cactus <i>Sclerocactus glaucus</i>	E, SE	None	No	Rocky hills, alluvial benches, and lower mesa slopes in desert shrub communities from 4,500 to 6,000 feet.
<sup>1</sup> Status: T – Federally Threatened; E – Federally Endangered; C – Federal Candidate; SE – Colorado Endangered; ST – Colorado Threatened; SC – Colorado Candidate. (USFWS, 2013a). <sup>2</sup> Potential Occurrence based on habitat associations and known distributions: None: May occur in Delta County but restricted distributions are distant and/or habitat is not present in the project area. Unlikely: May occur in Delta County and marginally suitable habitat present in the project area. Possible: Occurs in Delta County, suitable habitat is present, but not observed in the project area. Present: Observed in the project area and/or occupied habitat includes the project area. <sup>3</sup> Source: CPW, 2012a; CNHP, 2012.				

**Table 17**  
**BLM and USFS Sensitive Species that May Be Present in or near the LBA Tract**

Common Name/ Scientific Name	USFS Status	BLM Status	CPW Status <sup>1</sup>	Potential Occurrence in the Analysis Area <sup>2</sup>	Habitat <sup>3</sup>
<b>Mammals</b>					
American marten <i>Martes Americana</i>	Sensitive	N/A	N/A	Likely	Subalpine, spruce-fir and lodgepole pine forests, alpine tundra and occasionally Montane forests. Generally associated with older growth or mixed age stands of spruce fir and lodgepole pine.
Spotted bat <i>Euderma maculatum</i>	Sensitive	Sensitive	N/A	Possible	Ponderosa pine in montane forest, pinyon-juniper woodlands, aspen, semi-desert shrublands.
Townsend's big-eared bat <i>Corynorhinus townsendii</i>	Sensitive	Sensitive	SC	Possible	Montane forests, pinyon-juniper woodlands, semi-desert shrublands.
Fringed myotis <i>Myotis thysanodes</i>	Sensitive	Sensitive	N/A	Possible	Ponderosa pine, greasewood, oakbrush, saltbush shrublands.
Hoary bat <i>Lasiurus cinereus</i>	Sensitive	N/A	N/A	Likely	Roosts in deciduous trees, forages over open watercourses and ponds.
Allen's (Mexican) big-eared bat <i>Idionycteris phylotis</i>	N/A	Sensitive	N/A	Unlikely	Ponderosa pine, pinyon-juniper woodland, oak brush, riparian woodland (cottonwood); typically found near rocky outcrops, cliffs, and boulders; often forages near streams and ponds.
Big free-tailed bats <i>Nyctinomops macrotis</i>	N/A	Sensitive	N/A	Possible	Occur in rocky areas and rugged terrain in desert and woodland habitats. Roost in rock crevices in cliffs and caves, and occasionally in tree cavities.
<b>Birds</b>					
American peregrine falcon <i>Falco peregrinus anatum</i>	Sensitive	Sensitive	SC	Possible	Open conifer forests, riparian forests, and cliffs; migrant in western Colorado.
Bald eagle <i>Haliaeetus leucocephalus</i>	Sensitive	Sensitive	SC	Possible	Reservoirs, rivers, wintering in semi-desert and grasslands.
Northern goshawk <i>Accipiter gentilis</i>	Sensitive	Sensitive	N/A	Possible	Forests of aspen, ponderosa pine, lodgepole pine; larger trees for nesting.
Ferruginous hawk <i>Buteo regalis</i>	Sensitive	Sensitive	N/A	Unlikely	Grassland, semi-desert shrublands, rare in pinyon-juniper; nest on isolated structures.
Flammulated owl <i>Otus flammeolus</i>	Sensitive	Sensitive	N/A	Possible	Old growth and mature ponderosa pine, Douglas fir, lodgepole pine, spruce/fir mixed with aspen, pinyon-juniper, hardwood forests from 6,000-10,000 feet.
Purple martin <i>Progne subis</i>	Sensitive	N/A	N/A	Possible	Inhabits old growth aspen, mixed aspen/ponderosa pine or Douglas fir, deciduous riparian woodlands, burns

Common Name/ Scientific Name	USFS Status	BLM Status	CPW Status <sup>1</sup>	Potential Occurrence in the Analysis Area <sup>2</sup>	Habitat <sup>3</sup>
					with snags. Migratory. Known to nest in watershed.
Olive-sided flycatcher <i>Contopus cooperi</i>	Sensitive	N/A	N/A	Present	Inhabits open mature spruce/fir and Douglas Fir. Forages in woodlands near edges, clearings, bogs, streams, and burned areas. Uses tall exposed perches in tops or high exposed limbs of trees. Migratory.
Lewis's woodpecker <i>Melanerpes lewis</i>	Sensitive	Sensitive	N/A	Possible	Open forest and woodland, often logged or burned, including oak, coniferous forest (often ponderosa), riparian woodland, and orchards, less often in pinyon-juniper.
<b>Fish</b>					
Colorado River cutthroat trout <i>Oncorhynchus clarki pleuriticus</i>	Sensitive	Sensitive	SC	Possible	Clear, headwater streams in the Colorado River drainage, clear mountain streams; no known populations of pure strain cutthroats on public lands managed in the LBA tract.
<b>Amphibians</b>					
Northern leopard frog <i>Rana pipiens</i>	Sensitive	Sensitive	SC	Present	Margins, banks of marshes, ponds, streams, other permanent water.
<b>Reptiles</b>					
Milk snake <i>Lampropeltis triangulum taylori</i>	N/A	Sensitive	N/A	Possible	Grasslands, sandhills, canyons, open woodlands ponderosa, pinyon-juniper; known along the North Fork of the Gunnison River.
Midget faded rattlesnake <i>Crotalus viridis concolor</i>	N/A	Sensitive	SC	Possible	Most terrestrial habitats in west-central Colorado including grasslands, shrublands, pinyon-juniper woodlands, coniferous forests.
<sup>1</sup> Colorado Parks and Wildlife Status Codes: SC = State Special Concern (not a statutory category) (CPW, 2013a). <sup>2</sup> Potential Occurrence based on habitat associations and known distributions: Unlikely: May occur in Delta County and marginally suitable habitat present in the project area. Likely: Occurs in Delta County, suitable habitat is present, likely to be present in the project area. Possible: Occurs in Delta County, suitable habitat is present, but not observed in the project area. Present: Observed in the project area and/or occupied habitat includes the project area. <sup>3</sup> Sources: CNHP, 2013; CPW, 2012a; Weber and Wittmann, 1987; Andrews and Righter, 1992; Hammerson, 1986; Woodling, 1985; Fitzgerald et al., 1994.					

### **Federally-Listed Species**

**Canada Lynx.** Canada lynx (*Lynx canadensis*) are known to be present on Grand Mesa, and at this time, all suitable habitats are considered to be occupied by this species (USFWS, 2010). The Spruce Stomp LBA area contains approximately 75 acres of mapped lynx habitat, all within the Crater Lake lynx analysis unit (LAU) on the Gunnison National Forest. This habitat is all west of the Stevens Gulch road and south of West Terror Creek, and much of it is within the riparian zone of the creek. The lease area also falls outside a USFS and BLM mapped LAU (BLM,

2002). No critical habitat has been designated in Colorado (USFWS, 2009a). There is little to no denning, wintering, or dispersal habitat (spruce/fir) within the proposed lease area.

**North American Wolverine.** On February 4, 2013, the USFWS published a proposed rule to list the distinct population segment (DPS) of the North American wolverine occurring in the contiguous United States, as a threatened species under the Endangered Species Act - ESA (USFWS, 2013b). The DPS evaluation in the proposed rule concerns the segment of the wolverine species occurring within the contiguous 48 states, including the northern and southern Rocky Mountains, Sierra Nevada Range, and North Cascades Range (USFWS, 2013b). The proposed rule did not propose any critical habitat for the species.

There are numerous historical records of North American wolverines from the Colorado Rocky Mountains; however, the species is believed to have been extirpated from the Southern Rocky Mountains in Colorado, New Mexico, and Wyoming by the early 1900s (Aubrey et al., 2007 cited in USFWS, 2013c).

**Colorado River Endangered Fishes.** The federally endangered Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*) are not present on the LBA tract but are found 30 miles downstream (USFWS, 1994) of the lease area in portions of the Colorado River system. No suitable habitat for these species is found within the LBA tract.

**Greenback Cutthroat Trout.** After passage of the Endangered Species Act of 1973 (USFWS 1973), the Greenback Cutthroat Trout (GBCT) (*Oncorhynchus clarki stomias*) was listed as Endangered (USFWS, 1998). In 1978, the species was down-listed to Threatened (USFWS, 1977; USFWS, 1998). No critical habitat has been designated for this species (USFWS, 2009b).

Questions about the taxonomic distinctions between greenback cutthroat trout and Colorado River cutthroat trout remain unresolved (USFWS, 2009b; USFWS, 2012). Based on recent genetic work, cutthroat trout in Colorado have been assigned to different DNA lineages, including the following: GB (greenback), CR (Colorado River), and RG (Rio Grande). It is not known if the DNA lineages represent subspecies.

MEC conducted sampling along the West Fork Terror Creek in 2012 (WWE, 2013a). Fin clips were analyzed for DNA sequence and based on this analysis, the cutthroat trout population in West Fork Terror Creek was identified with approximately 94 percent purity as GB-lineage cutthroat trout. At this time the USFWS considers GB-lineage populations equivalent to greenback cutthroat trout, and they are therefore protected as a threatened species under provisions of the ESA.

CPW considers the mainstem of Terror Creek, from the confluence of the East and West Forks to the confluence with the North Fork, as occupied habitat for GBCT (Kowalski, 2010). Recent surveys documented GBCT in the West Fork of Terror Creek, the East Fork of Terror Creek, and the upstream portion of Terror Creek (WWE, 2013a). There are an estimated 151 to 400 GBCT per mile within the reaches sampled by the Forest Service (Carrillo, 2010; Dare et al., 2011). GBCT are currently confined to mid to high elevation, high gradient streams, and non-native

trout species currently constitute the greatest threat to the long-term health of this species (Young, 2009).

### **BLM and USFS Sensitive Species**

Sensitive species are discussed in detail in the BE and summarized here.

**Mammals.** The American marten is expected to occur in coniferous forest habitats within the West Terror Creek watershed. Martens show close association with mesic, dense coniferous forests with complex physical structure.

Six species of bats included in Table 17 could occur in the vicinity of the LBA tract:

- Spotted bats (*Euderma maculatum*) occur in ponderosa pine woodlands, pinyon-juniper woodlands, and open semi-desert shrublands (CPW, 2012b). Much of the roosting habitat within the North Fork River LHA area is in cracks and crevices in rock/cliff faces (BLM, 2007).
- Townsend's big eared bats (*Corynorhinus townsendii*) roost in caves, tunnels, mines, and buildings and can be found in lower elevation pinyon-juniper woodlands (Culver et al., 2008).
- Fringed myotis (*Myotis thysanodes*) commonly occupy oak and pinyon woodlands, as well as Douglas-fir and ponderosa pine forests, mines, caves, and buildings (Adams, 2003).
- Hoary bats (*Lasiurus cinereus*) roost in deciduous trees and forage over open watercourses and ponds.
- Allen's (Mexican) big-eared bats (*Idionycteris phyllotis*) occur in Ponderosa pine and pinyon-juniper woodlands, oak brush, riparian woodland (cottonwood). They are typically found near rocky outcrops, cliffs, and boulders and often forage near streams and ponds.
- Big free-tailed bats (*Nyctinomops macrotis*) occur in rocky areas and rugged terrain in desert and woodland habitats. They roost in rock crevices in cliffs and caves, and occasionally in tree cavities.

**Birds.** There are nine species of birds in Table 17 that are identified as BLM and/or USFS sensitive. Based on habitat present and the range of the species, these species are known to, or could, occur in the LBA tract. No survey information documenting population levels or status within the LBA tract for these species is available. Habitat requirements for these species include:

- Flammulated owls (*Otus flammeolus*) inhabit aspen stands at higher elevations within the drainage, and may use the project area for foraging.
- Brewer's sparrows (*Spizella berweri*) are a sagebrush-obligate species, occupying sagebrush steppe (Knick and Rotenberry, 2001) which may not be extensive enough within the LBA tract to support nesting populations.

- Northern goshawks (*Accipiter gentilis*) may nest within or adjacent to the LBA tract in larger trees.
- Purple martins (*Progne subis*) inhabit old growth aspen, mixed aspen/ponderosa pine or Douglas fir, deciduous riparian woodlands, and burns with snags.
- Olive-sided flycatchers (*Contopus cooperi*) inhabit open mature spruce/fir and Douglas fir woodlands.
- Lewis's woodpecker (*Melanerpes lewis*) inhabit open forests and woodlands, often logged or burned, including oak, coniferous forest (often ponderosa), riparian woodland, and orchards.

There is no suitable nesting habitat for bald eagles (*Haliaeetus leucocephalus*), ferruginous hawks (*Buteo regalis*), or peregrine falcons (*Falco peregrinus anatum*) within the LBA tract, although the lease area may be used for foraging. A Peregrine falcon nest has been located within 2 miles of the LBA tract, and individuals have been observed flying over the project area.

**Fish.** The LBA tract lies within the range of Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*); however, no individuals have been documented within the LBA tract. Refer to Greenback Cutthroat Trout section for discussion of genetic findings of Colorado River cutthroat trout lineages.

**Herpetofauna.** Sensitive BLM and/or USFS species of reptiles and amphibians likely or possibly present within the LBA tract, based on known distributions and habitat affinities, include the northern leopard frog (*Rana pipiens*), milk snake (*Lampropeltis triangulum taylori*), and midget faded rattlesnake (*Crotalus viridis concolor*). The northern leopard frog is usually found in permanent water with rooted aquatic vegetation. During the summer it inhabits wet meadows and fields (CPW, 2011). The northern leopard frog is known to be present in the general project area. The midget faded rattlesnake occurs in Delta County and is found in most habitats (CPW, 2011). Milk snakes occur in a variety of habitats including shrubby hillsides, canyons, and open stands of ponderosa pine with Gambel oak, pinyon-juniper woodlands, and river valleys (CPW, 2011). Milk snakes have been documented along the North Fork of the Gunnison River and could be present within the LBA tract.

### **USFS Management Indicator Species**

A complete table of all of the GMUG Management Indicator (MIS) species is presented in the MIS Assessment (available in the Project Record). The Brewer's sparrow is not known or expected to occur in the project area, is unlikely to be impacted, and will not be discussed. The Abert's squirrel is a ponderosa pine obligate, is not known or expected to occur in this area, and will not be discussed. The northern goshawk and American marten are also Sensitive species and are discussed in that section of this document, with additional consideration for management indicator status.

**Elk.** Populations are abundant (and stable or increasing) on the Forests in R2 and the GMUG. The project area lies in both elk summer range and winter range, although elk use of the immediate area in summer appears to be limited (D. Garrison, personal observation). The proposed activities lie within CPW's Game Management Unit (GMU) 521, which is part of elk

Data Analysis Unit (DAU) E-14. The elk population estimate for this DAU, based on 2011 post-hunting surveys, was 17,610 elk (CPW, 2013b), within the objective population of 15,000 to 19,000. CPW estimated that during the 2011 hunting season (the last for which data is currently available) for GMU 521 there were 3,142 total hunters, who harvested 671 elk, a 21 percent success rate (CPW, 2013c). Population estimates and hunt data for 2012 were not available as of the time of this analysis.

**Merriam's wild turkey.** Turkey are widespread and locally abundant across the Paonia district, especially in oak and other shrub habitats, but they occur in all areas below approximately 10,000 feet at times. Turkeys are known to occur in and near the project area (D. Garrison, personal observation) and both breeding behavior (strutting) and brood rearing have been observed in the lease area. They are tolerant of human activities, and in winter are commonly found in yards and along roadways in close proximity to humans. Breeding Bird data show a strong upward trend in populations of this species in Colorado (Sauer et al., 2011).

**Red-knaped sapsucker.** In Colorado, red-naped sapsuckers forage in aspen, willows, and cottonwoods close to their nest sites, which are almost exclusively in mature aspen stands. According to BBS, populations appear to be stable or increasing in the United States, with areas of local declines. From the period 1966 to 2010, the three sapsucker species (combined in the Breeding Bird Survey - BBS analysis) have exhibited a positive trend of +2.6 percent in Colorado (Sauer et al., 2011). Red-naped sapsuckers are seen in aspen stands throughout the district in relatively low numbers (D. Garrison, personal observation). No surveys for this species have occurred in the project area.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

#### **Federally-Listed Species**

**Canada Lynx.** The MDW as assumed under the reasonably foreseeable surface use scenario drilling activities would not adversely affect lynx denning habitat, wintering, or dispersal habitat. In addition, surface-disturbing activities would be limited in extent and would not occur during winter months; would not adversely affect local habitat components or stands in areas of lynx habitat; and would not cause lynx to avoid using the area. The Proposed Action would not notably affect lynx or suitable lynx habitat.

**North American Wolverine.** The Proposed Action is not likely to jeopardize the continued existence of North American wolverine, as there is currently no wolverine population in the State of Colorado. The available scientific and commercial information does not indicate that other potential stressors such as land management, recreation, infrastructure development, and transportation corridors pose a threat to the DPS (USFWS, 2013b). Section 7 (a)(4) of the ESA requires conferencing with FWS when a proposed action is likely to jeopardize the continued existence of a proposed species or destroy or adversely modify proposed critical habitat. Because the Proposed Action is unlikely to jeopardize the continued existence of North American wolverine, conferencing is not required.

**Colorado River Endangered Fishes.** No direct effects to endangered Colorado River fish are expected; however, water depletions associated with assumed activities could cause off-site effects to the endangered fish and their critical habitat (Colorado pikeminnow, Bonytail, Humpback chub and razorback sucker) in the lower Gunnison River and Colorado River (USFWS, 1994). Water depletions from the Upper Colorado River Basin would be likely to adversely affect the four federally-listed Colorado River fishes and likely to adversely modify their designated critical habitats. Water depletions were addressed in the USFWS Programmatic Biological Opinion (PBO) (ES/GJ-6-CO-08-F-0010) for water depletions associated with BLM projects authorized by the BLM within the Upper Colorado River Basin in Colorado on February 25, 2009 (USFWS, 2009b). The PBO includes reasonable and prudent alternatives developed by the USFWS, which allow BLM to authorize water depletions while avoiding the likelihood of jeopardy to the endangered fish and avoiding destruction or adverse modification of their critical habitat. The PBO requires the BLM State Office to track all projects that result in water depletions from the Upper Colorado River Basin and provide an annual report to the Service. In addition, the USFS has a PBO with the USFWS (ES/GJ-6-CO-99-F-033-CP062) which has a project limit of 50 acre-feet (yearly total 100 acre-feet). The UFO would include any water depletions associated with the project in the annual report to the BLM State Office.

To comply with the above PBO, the lessee is required to report their annual water depletions to the BLM UFO by September 30 each calendar year. This includes depletions that result from any coal mining-related actions within the project area, regardless of surface or mineral ownership. Depletion fees would be paid by the BLM as required in the above-mentioned PBO.

**Greenback Cutthroat Trout.** Potential effects to GBCT in Terror Creek and the West Fork of Terror Creek could occur from pumping water for drilling; if sediment entered the creeks as a result of soil disturbance from subsidence; or during construction and/or improvement of access roads. Impacts to water quality and quantity could have negative effects on GBCT populations. Dust, erosion, storm water runoff, chemical spills or fluid releases could be a concern if the roads and MDW pads are located within close proximity to the Terror Creek drainage.

On February 21, 2012, an informal Section 7 consultation for Bowie Resources Underground Coal Mining Associated Surface Activities and Facilities was completed by the USFWS, Western Colorado Ecological Services Field Office, and is contained in Appendix E to this EA. This consultation was done in order to reduce or eliminate potential impacts and a suite of conservation measures was developed by the BLM and Bowie. These conservation measures were concurred upon by the USFWS during the February 2012 informal consultation and would be applied to the LBA tract. Conservation measures include project setbacks from occupied streams; reclamation standards; erosion/sediment control measures and implementation monitoring; and measures to avoid take, entrapment, and entrainment of fish during water pumping activities (see stipulation section for details). Specifically, no new surface disturbance would occur within 200 feet of GBCT occupied habitat as measured from the normal high water mark, and maintenance of roads or other existing features within this zone would be limited to the existing road prism or footprint. The USFWS noted that their understanding of *surface disturbance* to be any project-related disturbance resulting in direct and pronounced alteration, damage, removal, displacement, or mortality of vegetation, soil, or substrates, or similar effects. Also, the BLM and the USFS have committed to ensuring that adequate and proper erosion control measures are implemented and effective, such that adverse effects do not occur to GBCT

and its habitat. Based on this information, the USFWS concurred with BLM's determination that the Proposed Action may affect, but is not likely to adversely affect greenback cutthroat trout, due to discountable and insignificant effects.

WWE conducted an analysis of potential subsidence impacts on the West Fork of Terror Creek aquatic life and water supply due to potential mining of the LBA tract (WWE, 2013a). Mining would be expected to result in a maximum subsidence of about 5.7 feet at the center, near the eastern edge, of the longwall panel with the smallest overburden thickness. This location is approximately 300 feet south of the West Fork of Terror Creek channel. Based on existing topography and geologic modeling, a maximum estimated 5.1 feet of subsidence along the West Fork of Terror Creek channel would be expected to create no more than a 1.5 percent channel slope change. Because the LBA tract generally consists of steep terrain (often in excess of 25 percent slopes), the expected change in slopes is expected to be mostly, if not completely, imperceptible without the aid of survey equipment. A change of 2 percent within the average channel slope of 5.5 percent could lead to an increase in the size of particles transported from 500 mm to 650 mm (WWE, 2013a). However, while some larger material would be mobilized following channel slope increase induced by subsidence, the overall stability of the largest particles should not be significantly compromised as a result of the slope change (WWE, 2013a). Other subsidence related impacts, such as surface cracking or water loss would not be expected to the degree that they would negatively impact the quality of the aquatic habitat of the LBA tract. Based on this analysis, adverse impacts to aquatic life would not be expected as a result of potential subsidence within the LBA tract. Since each of the respective agencies retains some level of discretion in the approval process for the proposed Federal Coal Lease Application, the BLM has been designated as the lead agency to satisfy the respective Endangered Species Act (as amended) Section 7 responsibilities of the cooperating agencies. The Biological Assessment assessed the effects of longwall coal mining and the anticipated subsidence on Greenback cutthroat trout (*Oncorhynchus clarki ssp. Stomias*) in the West Fork of Terror Creek.

The BLM Uncompahgre Field Office determined that the proposed underground coal mining activities in the Spruce Stomp LBA “**may affect, is not likely to adversely affect**” the threatened greenback cutthroat trout and threatened Canada lynx. The Fish and Wildlife Service concurred with BLM's determination on June 21, 2013.

### **BLM and USFS Sensitive Species**

Sensitive species are discussed in detail in the BE and are summarized here.

**Mammals.** The temporary loss of potential denning or foraging habitat to American marten caused by assumed road or pad construction is estimated at 3.9 total acres, which would be small in comparison to the 4,000 acres of available habitat (USFS, 2013b).

Effects to spotted bats could include short-term disturbance during assumed surface activities, as well as alteration of foraging habitat. However, alteration could be positive if the resulting openings in the vegetation are utilized by the bat. No roosting habitat occurs in the project area.

Effects to Townsend's big-eared bats could include short-term disturbance during project activities, as well as alteration of foraging habitat. Forest structure alteration may result in

changes to foraging behavior of this species if it uses the area. However, this change may be positive if the resulting openings in the vegetation are utilized by the bat. It is unlikely that any action related to the Proposed Action would result in damage or disturbance to roosting habitat, as none occurs in the project area.

Effects to fringed myotis bats could include short-term risk of mortality during removal of habitat, short-term disturbance during assumed surface activities, and long-term alteration of habitat. Roosting habitat is very limited within the lease (1.1 acres or 0.1 percent of the lease area), minimizing the likelihood of a pad or road being placed in the habitat (USFS, 2013b).

Effects to hoary bats could include short-term risk of mortality during removal of habitat, short-term disturbance during assumed surface activities, and long-term alteration of habitat. This species may utilize mature or dead aspen for roosting, especially trees with loose bark, although it is more known for cottonwood roost sites. Only 11.8 acres of riparian habitat are inventoried within the watershed, although cottonwoods are likely to occur along all perennial stream courses and may not be represented in the vegetation data (USFS, 2013b).

Effects to Allen's bats could include short-term risk of mortality during removal of habitat, short-term disturbance during assumed surface activities, and long-term alteration of habitat. Roosting habitat is very limited within the lease area, minimizing the likelihood of a pad or road being placed in the habitat.

Effects to big free-tailed bats could include short-term disturbance during assumed surface activities, as well as alteration of foraging habitat. However, alteration could be positive if the resulting openings in the vegetation are utilized by the bat. No roosting habitat occurs in the project area.

**Birds.** Potential foraging habitat for peregrine falcons, bald eagles, northern goshawk, and ferruginous hawk is present within the lease area; however, the small amount of potential habitat that would be removed versus available habitat within the lease area would not be expected to affect these species. No nesting substrate would be removed for these four species by assumed surface activities and no nests were observed during surveys.

Effects to purple martin could include: short-term effects during project activities, short-term potential for loss of young during harvest, and long-term changes to habitat. If any birds are nesting in aspen that is removed to create roads or pads, there is a risk of mortality of adults or young. This species is often found nesting immediately adjacent to well-used roads, including Stevens Gulch Road, so nearby construction activities are not expected to disturb this species.

Effects to olive-sided flycatcher could include short-term risk of mortality during removal of habitat, short-term disturbance during assumed surface activities, and long-term alteration of habitat. There could be a temporary loss of potential habitat caused by road or pad construction estimated at 3.9 total acres, which would be small in comparison to the 4,000 acres of available habitat (USFS, 2013b).

Effects to Lewis' woodpecker could include short-term risk of mortality during removal of habitat, short-term disturbance during assumed surface activities, and long-term alteration of habitat. As these birds nest locally primarily in cottonwoods, any loss or alteration of

cottonwood riparian habitat may reduce habitat for this species, and such alteration would be long-term, until large cottonwoods reestablish. It is unlikely that surface activities would occur immediately adjacent to the larger streams in this area (where cottonwoods occur) due to standard BMPs and design criteria for protection of greenback cutthroat trout, which would reduce the likelihood of loss of cottonwoods in the project area.

Flammulated owls utilize aspen habitats for nesting in the LBA tract. Assumed surface activities could result in an estimated temporary loss of up to 7.8 acres of aspen, mixed aspen, or riparian habitats. The watershed contains more than 6,000 acres of aspen habitats and several hundred acres of mixed aspen/conifer (USFS, 2013b).

**Herpetofauna.** There is no known occurrence of northern leopard frogs in the LBA tract; however, there is habitat along the permanent streams and in some stock ponds. MDW pads and access roads would not be constructed within wetlands, ponds, or reservoir habitats. Drilling should not result in habitat losses for milk snakes. Because midget faded rattlesnakes are found in most habitats within the LBA tract, they would be the most likely affected of the three species. The small amount of potential habitat removed versus available habitat within the lease area would not be expected to affect these species. As would be the case with any terrestrial wildlife species with a small home range, some direct mortality from machinery and human behavior may result in minor short-term effects to local populations.

**Fish.** Although potentially suitable habitat for roundtail chub and bluehead sucker occurs within the project area in the West Fork of Terror Creek, these species have not been documented. Effects described above for endangered fish would not be expected, and protective measures would also reduce potential effects to BLM sensitive fish species, if present.

### **USFS Management Indicator Species**

**Elk.** Effects to elk could include:

- 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; and/or
- long-term indirect effects through increase of road density within the watershed.

The proposed lease is not within mapped elk production areas (using CPW GIS data as of March 7, 2013). However, elk may calve at any location on and off the Forest, including in the project area. Therefore, if activities occur during calving season, elk may be displaced by project activities. Numerous studies have shown that elk will move back into an area once the disturbance is over and therefore any such displacement would be temporary.

The entire project area, and surrounding landscape, is considered as summer resident habitat, with elk commonly observed in this area during summer and fall. Currently, low levels of summer recreational use are known to occur in the area, other than the Stevens Gulch Road, which is well-used. Legal motorized use is limited to existing roads and trails, which occur throughout the watershed. The roads to be constructed for this project would not be open to public motorized use, and would be open to administrative (including coal traffic) use only, with

anticipated use levels other than during construction and drilling of one trip per day for maintenance and inspection. Pads are likely to include exhausters, with associated noise. Construction activities may occur into the fall hunting seasons. Disturbance to both local elk populations, and to hunters whose camps are no longer accessible or desirable due to project activities and/or traffic, is anticipated. As a result, changes to elk hunting pressure in both the immediate project vicinity and other portions of GMU 521 are expected. Due to the small scale of the disturbance and the size of the GMU, it is not anticipated that harvest will change measurably across the GMU as a result of this project.

Approximately half of the lease area is elk winter range. The remainder of the watershed to the south of the lease area is also winter range. Severe winter range and winter concentration areas occur at the lower end of the watershed, but not within the lease area. Winter range impacts to elk on NFS lands in this area will be mitigated by inclusion of a stipulation prohibiting construction of roads or pads from December 1 to April 15, unless otherwise authorized by the Forest in consultation with CPW.

Because elk are very adaptable, and use a wide variety of habitats, the loss of oak and forested habitat is unlikely to have any measurable effects to elk at the population scale, but will reduce forage availability at small scales over the short period when the pads and roads are in use. After use and reclamation, the road and pad footprint will be in a grass/forb state trending towards shrub and forest over longer terms. Effectively, the conversion will increase grass/forb forage availability in the pad and road footprints but reduce cover. Summer range does not appear to be a limiting factor for elk in the North Fork Gunnison area, and thus alteration of summer habitat is unlikely to cause noticeable population changes.

Project activities may change vulnerability of elk to hunting in this area. The roads created for this project will be closed to public use, but if construction occurs during hunting seasons, elk may be displaced into other areas where there may be more hunting pressure or more effective hunters. Hunters would likely avoid the area where construction is occurring.

Implementation of this project will increase overall road length within the planning area by approximately 4 miles between the period of construction and reclamation. While the roads are in existence, they would receive little use compared to the nearby Stevens Gulch Road. After reclamation, the roads would no longer be in place on the landscape and would not contribute to road density in the watershed.

### Summary and Conclusion

The negative effects from this project are of small magnitude and do not result in a Forest-wide decrease in trends or deter from meeting the MIS objectives in the Forest Plan.

**Merriam's wild turkey.** Effects to turkey could include:

- 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; and/or
- long-term indirect effects as a result of changes in human use in the area.

Habitat alteration can have both harmful and beneficial impacts to turkeys, and treatments which provide a mosaic of habitat features, allowing for all life stages of turkeys, are desired for this species (USFS, 2005). If temporary construction activities cause nests to fail, turkeys will make

multiple nesting attempts. Individual nests are unlikely to be lost during construction, as the area is not typical of nesting habitat and contains little dense cover. Long-term effects in cover type and abundance are unlikely to cause substantial impacts to turkeys, as they utilize a wide variety of habitats in this area, including roadsides and other disturbed sites. Turkeys appear to be using the area at this time and with the existing disturbance regime.

#### Summary and Conclusion

The negative effects from this project are of small magnitude and do not result in a Forest-wide decrease in trends or deter from meeting the MIS objectives in the Forest Plan.

**Red knaped sapsucker.** Effects could include:

- short-term effects of disturbance during construction;
- short-term potential for loss of young during construction; and/or
- long-term changes to habitat.

The nest-building through fledging period runs from about May 20 through August 25 for this species (Kingery, 1998). Project activities during this time may result in abandonment of nests or alteration of territorial boundaries in the project area. Individual nests with eggs or young could be lost during project activities if sapsuckers occur in the project area. This would most likely be either from nest abandonment due to disturbance, or through direct mortality.

#### Summary and Conclusion

The negative effects from this project are of small magnitude and do not result in a Forest-wide decrease in trends or deter from meeting the MIS objectives in the Forest Plan for all MIS species.

#### **Cumulative Impacts**

Prolonged mining would result in negligible impacts to threatened, endangered or special status species or habitat and population dynamics. Dispersed residential development is expected to continue in the area. This development could cause species sensitive to human activity to seek habitat outside the area of development. The increased presence of houses, other buildings, fences, roads, and traffic would also alter the movement of the species and increase losses due to human and other introduced species contact. Residential or other development would also result in minimal surface disturbance on habitats in the area. There would be negligible cumulative impacts to identified threatened, endangered or special status species or habitats from continued mining and other development activities in the LBA area.

#### **Stipulations**

The following stipulations for the LBA tract have been compiled from the BLM, USFS, and USFWS:

- State-of-the-art mining techniques (pillar and panel widths, rate of coal development and extraction, mine method, determining angle of draw, etc.) would be used to control subsidence. No mining-related surface disturbance (i.e., MDWs and roads – not including subsidence) would occur within 200 feet of greenback cutthroat trout occupied habitat, as measured from the normal high water mark, without a written finding from the Authorized Officer. These techniques would provide for maximum

coal removal while protecting the values associated with the threatened greenback cutthroat trout habitat.

- Adequate sediment control devices, such as silt fences or straw wattles composed of native substances or other effective BMPs, would be placed down slope from the pads and access roads to prevent potential sedimentation effects to West Terror Creek.
- In order to ensure that BMPs relating to the control of sediment from disturbed sites are in place and functional, lessee shall, during major runoff periods, use an independent contractor to inspect the lessee's well pad sites and access roads within the Terror Creek watershed. The independent contractor shall contact lessee, USFS, and the BLM (970-240-5300), within two business days of discovering sediment control measures that are missing or non-functional. Lessee will have three business days to correct the problem. Ineffective measures would be redesigned and replaced after consultation with USFS and BLM. For each year that lessee operates under this BA, lessee shall submit the compiled monthly inspection reports to BLM UFO by September 30. In the event new sediment control methods are identified or current practices are not working as intended, adaptive management will be used to implement methods that are effective at eliminating offsite movement of soils and sedimentation into resident streams.
- At any time during drilling activities, until successful reclamation or continuing into the future, the point of access to temporary roads shall be blocked with gates to prevent vehicles, including Off-Highway Vehicles (OHVs), from using them. Signs identifying the road closure shall be placed at the barricades.
- To prevent mortality of GBCT due to pumping from the East Fork of Terror Creek, the conservation measures are defined as: pumping during the June and July period would require the use of a screened pump intake, with a maximum ¼ inch size mesh. For the August through September period, when GBCT fry would be present in the stream, pump intakes would be screened with no larger than 1/16th mesh screen. The screen would not be confined to just the pump intake, but must cover a larger area, such as a cylinder or box design which has at least 5 times the surface area of the pump intake. Bowie must submit the final design for this screening fixture to the USFS and BLM fisheries biologists for their approval.
- During the June through September period, if the flows in East Terror Creek drop below the ten year mean monthly flow for October (1.0 cfs), lessee will not pump water from the East Fork of Terror Creek.
- To prevent impacts to GBCT fry and fingerlings, pumping would not take place during the base flow (low flow) periods of the year – October through March.
- If there are existing roads or disturbance features within the 200-foot buffer along GBCT habitat streams, then no additional surface disturbance will be permitted within those areas. Maintenance of roads or other existing features must remain within the existing road prism or footprint of the feature being maintained.

- The operator shall not store equipment, machinery, or construction materials in any locations that are 200 feet or less from the riparian zones of the streams within the Terror Creek watershed.
- No vegetation will be removed from the riparian zone of the streams in the Terror Creek watershed.
- During construction or maintenance activities in proximity to the 200-foot riparian buffer zone, the edge of the buffer zone shall be marked for avoidance by construction equipment and activities.
- Within the Terror Creek watershed, only fresh water, free of chemicals or other contaminants, may be used for dust abatement activities.
- Within the Terror Creek watershed, additional crossings of perennial streams will not be constructed
- The BLM or USFS hydrologist must approve, in advance, the size and composition of riprap material to be used in the East Fork of Terror Creek.
- Lessee must report their annual water depletions to the BLM UFO by September 30 each calendar year. This includes depletions that result from surface activities associated with coal mining related activities within the Action Area, regardless of surface ownership.
- No surface disturbance, such as road widening or upgrading would occur within 200 feet of GBCT occupied habitat, as measured from the normal high water mark, to protect delineated wetlands or riparian areas and maintain riparian vegetation and eliminate potential effects to the greenback cutthroat trout, unless exceptions were approved by the Authorized Officer.
- Site-specific surveys for sensitive plants would be conducted onsite prior to the development of any surface facilities or to other soil-disturbance activities.
- There would be no surface occupancy or soil-disturbing activities within a 100-foot radius of sensitive plant locations unless exceptions were approved by the Authorized Officer.
- Application of herbicides, surfactants, and other weed control measures would avoid overspray or drift onto desirable species or sensitive plants.
- If subsidence adversely affects surface resources in any way (including, but not limited to a documented water loss), the coal lessee, at their expense, will be responsible to: restore stream channels, stock ponds, protect stream flow with earthwork or temporary culverts, restore affected roads, or provide other measures to repair damage or replace any surface water and/or developed groundwater source, water conveyance facilities, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, and wildlife use, as authorized by 36 CFR 251. An appropriate augmentation plan for replacement water will be decreed prior to commencing mining activities and will consider drought conditions and the limitations of local water supplies.

- The lessee/operator would design the layout of longwall panels to minimize impacts to West Fork Terror Creek. Primarily, this will consist of orienting panels approximately parallel with the creek as currently proposed and represented in the Subsidence Report (WWE, 2013a), thus reducing the number and severity of transitions from subsidence to non-subsidence zones.
- The lessee/operator would design and implement a stream flow measurement program. The program will consist of establishing monitoring stations upstream and downstream of the expected subsidence area on West Fork Terror Creek. Flow monitoring stations will be designed and calibrated by water resource engineers and will focus on continuous measurements of low and base flow conditions (i.e., summer through late fall). Lessee/operator staff will have trained staff available to conduct site visits to ensure continuous flow measurements are recorded on a minimum monthly schedule, weather permitting. Flow data will be compiled into an annual report that will include comparisons to previously collected data. This report will be submitted to the BLM, USFS and USFWS.
- The lessee/operator will conduct fish, sediment and macroinvertebrate sampling (as performed by WWE and MEC in 2012) every two years during and twice following the mining activities (at 5 and 10 years periods) prior to bond release. A report should be distributed to the BLM, USFS and USFWS documenting if statistically significant declines are observed related to mining activities. If a statistically significant decline in the fishery within the subsidence area results from the Proposed Action (i.e., a decline at sites within the subsidence area does not correlate with a decline in the fishery outside the subsidence area), the lessee/operator will investigate the cause of the decline. If the decline is resulting from habitat changes as a result of longwall mining induced subsidence, the operator/lessee will engage a fish habitat ecologist to design habitat enhancement structures to mitigate the observed impacts. If a decline in fish numbers persists following mitigation of an observed physical or chemical impact, the lessee/operator will work with CPW to capture and grow out fish populations from appropriate breeding stock. The lessee/operator will establish a minimum of two subsidence monitoring gridlines across the stream channel in areas of anticipated vertical displacement that will be surveyed prior to and following longwall mining beneath the area. These survey data will be used to confirm/refine the subsidence predictions for the area. The results of these surveys, as available, will be included in the previously mentioned annual Monitoring Report and distributed accordingly.

### **Finding on the BLM Public Land Health Standard for Threatened and Endangered Species**

The LHA (BLM, 2007) identified this area as meeting Public Land Health Standard 4 for special status species, including threatened and endangered species, but with problems, mainly as a result of weed infestations affecting the quality of available habitat. Fish habitat within the project area is in good condition with adequate riparian vegetation and water quality. The assumed surface activities with implementation of BMPs and stipulations should not further degrade the quality of special status species populations and communities within the project area. The Standard with regard to threatened and endangered species, therefore, would be met.

## **No Action Alternative**

The No Action Alternative would have no impacts to threatened, endangered, or sensitive species within the lease area because the lease would not be issued.

## **MIGRATORY AND OTHER BIRDS OF CONSERVATION CONCERN**

### **Affected Environment**

The cumulative effects analysis area is defined by the expanded watershed area 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 back towards the town of Delta.

The Migratory Bird Treaty Act (916 U.S.C. 703-711) identifies numerous bird species of the southwestern U.S. that are assigned a migratory status. USFS and BLM have signed Memorandums of Understanding (MOUs) with the USFWS, which are intended to strengthen migratory bird conservation efforts by identifying and implementing strategies to promote conservation and reduce or eliminate adverse impacts on migratory birds. The focus of the agencies' conservation efforts is on migratory species and some non-migratory game bird species that are listed as Birds of Conservation Concern (BCC). BCC have been identified by the USFWS (2008) for different Bird Conservation Regions (BCR) in the United States to identify those species in the greatest need of conservation action, outside of those species already listed by the USFWS as threatened or endangered. The entire project area is in BCR 16, the Southern Rockies/Colorado Plateau region. The USFWS lists 27 species (see Table 18) that are BCC in BCR 16 (USFWS, 2008). Table 18 also shows the probable status for each species within the LBA tract (Kingery, 1998; CPW, 2011). Several of the species in Table 18 were also included in the Endangered, Threatened, and Sensitive Species section.

Based on species' known distributions and habitat associations in western Colorado, 12 species are known or have potential to occur in the project area (see Table 18). Two of these species were observed on-site during surveys: peregrine falcon and golden eagle. An active peregrine falcon nest is located in the upper end of Dove Gulch. This is the only active peregrine nest known to occur in this general area. The nest is located over a high ridge and more than two miles from any assumed activity associated with road and pad construction and drilling activity.

The bald eagle is present as a winter resident along the North Fork of the Gunnison River. The river and adjacent habitats are designated as Bald Eagle Winter Forage Range by CPW (2011), of which a small portion of the designated range overlaps the southern boundary of the LBA tract and access roads. Biological surveys indicate that bald eagle activity has been observed along the North Fork Valley, but that no bald eagles have been sighted in Bowie's mine area or in areas near the mine for several years.

**Table 18**  
**Birds of Conservation Concern within BCR 16**

<b>Common Name Scientific Name</b>	<b>Habitat <sup>1</sup></b>	<b>Potential Occurrence in Project Area</b>
Gunnison sage-grouse <i>Centrocercus minimus</i>	Expansive sagebrush with grasses, forbs, and healthy riparian; project outside of expected range.	No
American bittern <i>Botaurus lentiginosus</i>	Dense freshwater marshes and extensive wet meadows.	No
Bald eagle <i>Haliaeetus leucocephalus</i>	Nests and roosts in large cottonwoods along rivers near prey or carrion during winter.	Yes
Ferruginous hawk <i>Buteo regalis</i>	Nests in isolated trees, rock outcrops, artificial structures, ground near prey base.	No
Golden eagle <i>Aquila chrysaetos</i>	Nest on open cliffs and in canyons or in tall trees (cottonwoods) in open country and riparian zones.	Yes
Peregrine falcon <i>Falco peregrinus</i>	Nests on high cliff faces, often near water; forages in adjacent habitats.	Yes
Prairie falcon <i>Falco mexicanus</i>	Nests in cavities on cliffs, rock outcrops adjacent to open grassland, shrublands.	Yes
Snowy plover <i>Charadrius alexandrinus</i>	Barren or sparsely vegetated alkaline flats and river bars.	No
Mountain plover <i>Charadrius montanus</i>	Short-grass prairie and shrub-steppe landscapes.	No
Long-billed curlew <i>Numenius americanus</i>	Short-grass grasslands, wheat fields, dry land agriculture near water.	No
Yellow-billed cuckoo <i>Coccyzus americanus</i>	Riparian forested habitats dominated by cottonwoods.	No
Flammulated owl <i>Otus flammeolus</i>	Nests in forest of ponderosa pine and Douglas-fir with aspen, and in aspen stands.	Yes
Burrowing owl <i>Athene cunicularia</i>	Nests in burrows, especially prairie dog / badger burrows in grasslands, desert shrub.	No
Lewis's woodpecker <i>Melanerpes lewis</i>	Nests in open stands of cottonwood riparian or urban stands, also in aspen, oak shrub.	Yes
Willow flycatcher <i>Empidonax traillii</i>	Dense riparian habitats along rivers, streams, or other wetlands.	No
Gray vireo <i>Vireo vicinior</i>	Nests in open pinyon-juniper stands with mountain mahogany, deciduous shrub interspersed.	Yes
Pinyon jay <i>Gymnorhinus cyanocephalus</i>	Nest in pinyon and/or juniper woodlands, feed/cache pinyon nuts, juniper berries.	Yes
Juniper titmouse <i>Baeolophus griseus</i>	Nests in pinyon and/or juniper open or dense woodlands, often intermixed with Gambel oak.	Yes
Veery <i>Catharus fuscescens</i>	Damp deciduous/mixed woodlands with dense understory, wood swaps/lowlands, and damp ravines.	No

<b>Common Name Scientific Name</b>	<b>Habitat <sup>1</sup></b>	<b>Potential Occurrence in Project Area</b>
Bendire's thrasher <i>Toxostoma bendirei</i>	Open farmlands, grasslands, and brushy arid to semi-arid deserts; breeds mainly in grasslands, shrublands or woodlands.	No
Grace's warbler <i>Dendroica graciae</i>	Open montane forests, especially oaks, junipers, firs, and pines.	Yes
Brewer's sparrow <i>Spizella breweri</i>	Nests in sagebrush, occasionally greasewood, rabbitbrush in desert valleys.	No
Grasshopper sparrow <i>Ammodramus savannarum</i>	Grasslands with few scattered shrubs.	No
Chestnut-collared longspur <i>Calcarius ornatus</i>	Shortgrass or mixed-grass habitats heavily grazed or recently burned.	No
Black rosy-finch <i>Leucosticte atrata</i>	Alpine areas usually near rock piles and cliffs; winters in mountain meadows, high deserts, valleys, and plains.	No
Brown-capped rosy-finch <i>Leucosticte australis</i>	Nests on cliffs or in caves, rock slides or old buildings above timberline.	No
Cassin's finch <i>Carpodacus cassinii</i>	Nests in montane forests with spruce/fir and aspen; also in lower pinyon-juniper woodlands.	Yes
<sup>1</sup> Based on Righter et al., 2004.		

## Environmental Consequences/Stipulations

### Proposed Action

Underground activities would have no impacts on migratory bird and/or raptor populations. There is potential for disturbance to migratory birds during drilling, access, and site reclamation activities associated with MDW drilling where vegetation would be disturbed on approximately 45 acres of disturbance. This includes direct impacts to unidentified active nests, potential mortalities and injuries to birds and eggs in unidentified nests and disturbance to suitable nesting habitat potentially resulting in incidental "take" of migratory birds. To minimize or avoid effects to nesting migratory birds, where practicable, the lessee would avoid vegetation removal during the migratory bird nesting period (May 15 to August 1).

Raptors nesting in the project area could abandon nests because of noise and human presence during the breeding period, which varies by species. Recent surveys within the LBA tract did not observe raptor nests within woodland habitat 0.25 mile from the LBA tract or within cliffs 0.5 mile from the LBA tract. An historical red-tailed hawk nest site (*Buteo jamaicensis*) is located north of the switchback on Stevens Gulch Road. It is not expected that assumed surface activities would affect nesting raptors.

### Cumulative Impacts

Prolonged mining would result in negligible impacts to migratory and other BCC habitat and population dynamics. Dispersed residential development is expected to continue in the area. This development could cause birds sensitive to human activity to seek habitat outside the area of development. The increased presence of houses, other buildings, fences, roads, and traffic would also alter the movement of the birds and increase losses due to human and other

introduced species contact. Migratory and other birds of conservation concern and their habitats would still be present in the area, but they would likely be altered or reduced.

## **Stipulations**

The BLM and the USFS would require the following stipulations:

- For any future proposed disturbances on the lease, a qualified biologist would conduct pre-construction breeding bird and raptor surveys during the breeding period within 0.5 mile of the general disturbance area (drill pads and access roads) if activities would occur during the breeding season (generally May 15 to August 1, but varies by species). Surveys would document active nests and aspen snag reconnaissance prior to surface disturbance. If no active nests are found and a survey report is submitted to and approved by the USFS or BLM Biologist, activities may begin within the cleared areas. If active nests are found, development timing would be restricted during the breeding season, as per the USFS or BLM authorized officer.
- Where practicable, surface disturbing activities should not occur during the migratory bird nesting period (May 15 through August 1) to prevent potential take of migratory birds and/or eggs, unless vegetation is removed prior to May 15. Nesting surveys conducted within 2 weeks of surface-disturbing activities that indicate no migratory bird species are nesting or otherwise present within the area to be disturbed may also be considered; however, consultation and approval by USFS or BLM would be required. If active nests were identified during mine permit related project disturbances, appropriate measures would be taken in order to reduce impacts to these species, including relocating overland access routes and drill-hole locations, and implementing disturbance-free buffer zones and timing limitations for active nests as recommended by the USFS or BLM.
- All unavoidable surface disturbances would require approval of the USFS or BLM Authorized Officer. The USFS or BLM would coordinate with USFWS to determine the type and extent of allowable variances. A site-specific examination would determine if this stipulation would apply.

## **Finding on the BLM Public Land Health Standard for Threatened and Endangered Species**

The LHA (BLM, 2007) identified this area as meeting Public Land Health Standard 4 for special status species, including threatened and endangered species and migratory birds. However, increased weed infestations have negatively affected the quality of available habitat. The project area was mapped as being at the margins of bald eagle winter range, and populations of wintering bald eagles have increased in the North Fork LHA area. The assumed surface activities should not adversely affect migratory birds or their habitat and should maintain this Standard over the life of mine.

## **No Action Alternative**

Under the No Action Alternative, there would be no impacts to migratory birds within the LBA tract because the lease would not be issued.

## **WILDLIFE, TERRESTRIAL**

### **Affected Environment**

For terrestrial wildlife, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

The LBA tract occurs within CPW Game Management Unit (GMU) 521. Big game species harvested in this GMU include mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), moose (*Alces alces*), black bear (*Ursus americanus*), and cougar (*Puma concolor*). CPW has mapped seasonal ranges utilized by game species (CPW, 2012c), and all portions of the project area are classified as overall range for those big game species, as well as for turkey (*Meleagris gallopavo*) (game bird). CPW identifies the area as part of the overall range for moose on Grand Mesa. Though uncommon in the area, moose may utilize oak habitat present in the LBA. Elk winter range and mule deer summer range have also been classified within the project area. Portions of the lease tract have been identified as black bear fall concentration areas. Turkey and elk populations within the area are doing well (BLM, 2007). Mountain shrub habitat is widespread on the lower slopes of Grand Mesa, and other terrestrial wildlife associated with this habitat type in this area includes species such as coyote (*Canis latrans*), bobcat (*Lynx rufus*), porcupine (*Erethizon dorsatum*), eagles, hawks, dusky grouse (*Dendragapus obscurus*), numerous migratory bird species, small mammals, amphibians, and reptiles (BLM, 2007). Wildlife habitat conditions in the area are generally good, with some areas heavily utilized by mule deer and elk, usually as a result of use constraints imposed by winter weather.

### **Big Game Critical Winter Habitats and Migratory Routes**

The entire project area is mapped as elk winter range. Many elk and deer winter below the proposed project area, but wintering use is influenced by snow depths. In addition, migratory deer and elk utilize the area during two major migration periods during the year when they migrate between high elevation summer range and lower elevation winter range. The migration periods are largely driven by weather patterns and snowline elevations in the fall and spring. The proposed project area is also excellent black bear habitat providing an abundance of native summer vegetation and fall berry and acorn crops which tend to concentrate bears.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

The assumed surface disturbance associated with MDWs and access roads may result in some temporary disturbance and in the displacement of local wildlife species from habitats near surface activities, in response to increased human presence and activity (noise). The disturbance and displacement would result in short-term impacts to individuals; however, due to the limited duration of activities and the availability of other unaffected suitable habitats in the vicinity of the proposed lease area, impacts would not be detrimental to population status and health. Presence of garbage during MDW construction activities could attract bears.

It is assumed that there would be a short-term loss of approximately 45 acres of wildlife habitat resulting from the construction of MDW pads and access roads. These impacts would not be long-term because the drill pads and access roads would be reclaimed after mining. In the long-

term, reclamation would return the habitat to its pre-disturbed condition. Underground activities would not have an impact on terrestrial wildlife.

Based on CPW GIS data (March 7, 2013), the proposed lease area is not within mapped elk production areas; however, elk may calve at any location within the project area. Therefore, if activities occur during calving season, elk may be displaced by project activities. Numerous studies have shown that elk will move back into an area once the disturbance is completed and therefore any such displacement would be temporary (USFS, 2013b).

### **Cumulative Impacts**

Other than what has already been analyzed, prolonged mining would result in negligible impacts to wildlife habitat and population dynamics. Dispersed residential development is expected to continue in the area. This development could cause wildlife sensitive to human activity to seek habitat outside the area of development. The increased presence of houses, other buildings, fences, roads, and traffic would also alter the movement of big game animals, and would restrict hunting and other recreational opportunities. Wildlife and their habitats would still be present in the area, but they would likely be altered or reduced.

### **Stipulations**

The BLM and the USFS would require the following stipulations:

- Facility construction and major scheduled maintenance shall not be authorized within big game winter ranges from December 1 through April 15. All unavoidable surface disturbances within the winter ranges during these times would require approval of the USFS or BLM Authorized Officer and consultation with CPW. Monitoring and access to the sites by over-the-snow vehicles shall be permitted, but no snow plowing may occur.
- Bear-proof containers shall be used and refuse collected frequently to minimize potential for human-bear conflicts at construction sites. Employee training would include information to reduce bear-human conflicts including not feeding bears.
- Noise reduction mitigation shall be utilized on the individual MDW pumps to reduce impacts from their operation.

### **Finding on the BLM Public Land Health Standard for Plant and Animal Communities (partial, see also Vegetation; Invasive, Non-native Species; and Wildlife, Aquatic)**

The area of the proposed lease tract meets Public Land Health Standard 3 for healthy native communities (BLM, 2007). The abundance of exotic and noxious vegetative species is increasing and that could decrease the habitat value for wildlife. With implementation of the measures listed within the invasive, non-native species section and other BMPs, viable wildlife populations and communities would be maintained. The public lands within the LBA tract would continue to meet the standards for healthy plant and animal communities after implementation of the Proposed Action.

### **No Action Alternative**

There would be no impacts to terrestrial wildlife as a result of the coal lease and subsequent coal extraction because the lease would not be issued.

## **WILDLIFE, AQUATIC**

### **Affected Environment**

For aquatic wildlife, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

Aquatic habitat is present in Terror Creek and its tributaries. Greenback cutthroat trout are known to be present in the East and West Forks of Terror Creek and are believed to be present in Terror Creek (Speas, 2010; Carrillo, 2010; WWE, 2013a). This species is discussed in the Endangered Species section of this document. Additional species known to be present in this stream system include speckled dace (*Rhinichthys osculus*) and mottled sculpin (*Cottus bairdi*) (Carrillo, 2010; WWE, 2013a). It is likely that additional species are present. Aquatic habitat in the West Fork of Terror Creek is well shaded by riparian vegetation, with stable banks, and a stable substrate. Approximately 2.5 miles of the West Fork of Terror Creek are contained within the proposed lease area.

### **Environmental Consequences/Stipulations**

#### **Proposed Action**

Some short-term increases in sediment production associated with MDW drilling could occur, especially during high intensity storm events. The topography is steeper for the LBA tract, which slopes to the West Fork of Terror Creek on the north and east side and Stevens Gulch on the west. Mining of the LBA tract, along with implementation of the stipulations, should result in minimal impacts to aquatic habitat and aquatic life (see also the Endangered Species section of this document). There would be no impacts to Terror Creek stream flows from subsidence related to coal extraction in the current mine plan (WWE, 2013a).

#### **Cumulative Impacts**

Disturbance of aquatic species in the Terror Creek watershed would continue to take place as a result of coal mining, livestock grazing, recreation, timber sales, and other human activities. Due to the short-term nature, and small acreage that would be impacted by actions associated with this lease, it is unlikely that they would contribute to a detectable increase in cumulative impacts on aquatic species in the Terror Creek watershed.

#### **Stipulations**

No additional stipulations to those in the Wild and Scenic Rivers, and Endangered Species sections of this document.

#### **Finding on the BLM Public Land Health Standard for Plant and Animal Communities**

The riparian areas, including riparian vegetation along Terror Creek within the project area and Stevens Gulch downstream of the project area meet Standard 2 (BLM, 2007). These areas have no evident problems with hydrology, vegetation, or excessive erosion and deposition from either the stream channel or watershed, with the exception of weed problems. With the implementation of the BMPs and stipulations described, the aquatic habitats in the lease area would continue to meet public land health standards.

## **No Action Alternative**

There would be no impacts to aquatic species or habitat as a consequence of mining activities associated with the lease because the lease would not be issued. Mining are previously leases lands are not expected to impact aquatic species or their habitat.

## **WETLANDS AND RIPARIAN AREAS**

### **Affected Environment**

For wetlands and riparian areas, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

No wetlands, as defined in Section 404 of the Clean Water Act, have been identified within the LBA tract (National Wetlands Inventory - NWI, 2013). Approximately 11.5 acres of riparian habitat are present within the LBA tract. This riparian habitat is dominated by blue spruce which typically contains limited populations of narrowleaf cottonwood and willows, including strapleaf, mountain or whiplash willow.

### **Environmental Consequences/Stipulations**

#### **Proposed Action**

Surface-disturbing activities associated with MDWs would be located so as to minimize direct and indirect impacts to riparian zones and Waters of the U.S., including any wetland/riparian areas associated with Terror Creek (11.5 acres); therefore, the Proposed Action are not expected to impact Waters of the U.S. or wetlands under the Proposed Action and no permit from the U.S. Army Corps of Engineers would be required.

Existing roads through the LBA tract that would be used for MDW construction and operation occur immediately adjacent to both Terror Creek and Stevens Gulch. The operation of vehicles on these roads may slightly increase the rate of sedimentation into the stretches of streams closest to the roads. Newly constructed routes associated with MDW operations may also slightly increase the rate of sedimentation into adjacent riparian areas. With the stipulations shown below, consistent with experiences with other operations nearby, the amount of sedimentation from these activities would be expected to be minimal and short-term.

According to a study of the LBA tract by WWE (2013a), potential subsidence impacts from under-mining riparian areas in the LBA area would be minimal. Impacts to the vegetation community resulting from channel profile changes could occur if water availability along the riparian corridor is significantly altered or if slope instability occurs. Based on the magnitude of slope changes, the wetted perimeter of West Fork Terror Creek is not expected to change noticeably following subsidence. Further, because the net change of channel slope over the LBA tract area should be zero, minimal constriction of the creek's wetted perimeter at certain locations should be balanced by minimal expansion of the creek's wetted perimeter at other locations. Based on the existing presence of steep slopes along the creek and expected magnitude of slope changes, increased slope instability is not expected to a degree that would result in impacts to the vegetation community. Adverse impacts to riparian vegetation resulting from channel profile changes are not expected.

### **Cumulative Impacts**

Mining of coal and dispersed residential development is expected to continue in the general mine area. This development could include or cause such items as additional water diversion, livestock grazing on private lands, or new invasive weeds which would remove or alter local riparian areas and their present vegetation communities on private lands in the area. These activities could cause increased erosion and sedimentation, affecting the water quantity/quality within the hydrographic region. Federal regulations under Section 404 of the Clean Water Act would reduce the potential for developments to remove or impact wetlands in the area.

### **Stipulations**

No additional stipulations would be required to protect wetlands and riparian areas in addition to those identified in the Threatened, Endangered and Sensitive Species section.

### **Finding on the BLM Public Land Health Standard for Riparian Systems**

The proposed LBA tract is identified as meeting Public Land Health Standard 2 for water quality (BLM, 2007). Terror Creek has 11.5 acres of riparian habitat. Based upon the lack of disturbance to wetlands and riparian zones within the proposed lease area, the criteria for this Standard would be met.

### **No Action Alternative**

Under the No Action Alternative, there would be no impacts to wetlands and riparian zones in the LBA tract because the lease would not be issued.

## **FLOODPLAINS**

A 100-year floodplain is defined by the Federal Emergency Management Agency (FEMA) as the area adjacent to a watercourse that has a 1 percent chance of becoming wet in any single year (FEMA, 1989). Floodplain maps have been prepared by FEMA that cover the proposed lease area, and no floodplains have been mapped within that area (FEMA, 1989). Potential subsidence from coal extraction beneath these creeks could result in minor local shifts in channel morphology and gradient. These changes would not be considered floodplain alterations; therefore, no direct, indirect, or cumulative effects on floodplains are expected from the Proposed Action Alternative or the No Action Alternative.

## **WATER QUALITY, SURFACE AND GROUND**

### **Affected Environment**

For water quality, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

The SMCRA and the Colorado Surface Coal Mining Reclamation Act contain provisions for protection of water resources from effects of underground coal mining. Parts of these acts and enabling regulations provide for no disruption of the hydrologic balance (i.e., impart no material damage to these resources).

A cumulative hydrologic impacts analysis (CHIA) for the North Fork of the Gunnison River is periodically updated by DRMS as a means of assessing hydrologic impacts to surface and groundwater resources potentially caused by the three large mines in the North Fork Valley. The CHIA is updated if a permit revision predicts adverse effects to groundwater and surface water. The latest CHIA update was completed in 2009 (DRMS). If no adverse effects to groundwater and surface water are predicted, then the CHIA is not revised. The latest CHIA update is referenced in this findings document.

Under the state coal regulations, various state agencies have permitting authority for the activities associated with mining including reporting of monitoring results in an annual hydrologic report.

WWE with the assistance of C. Richard Dunrud, P.E., prepared a report - Evaluation of Potential Subsidence Impacts of Longwall Mining in the Spruce Stomp Lease Area to Aquatic Life and Water Supply (2013a) (see Appendix F). The report reviews potential subsidence impacts within the LBA tract and on the West Fork of Terror Creek aquatic life and water due to potential mining of the LBA.

**Surface Water.** The LBA tract is located in the Terror Creek watershed. Terror Creek has a drainage basin of approximately 18,826 acres (9.6 percent is within the LBA). The West Fork of Terror Creek is a perennial stream located on the LBA tract.

The Clean Water Act requires each state to compile a list of impaired waterbodies, known as the 303(d) list, that do not meet water quality standards for their designated uses. Terror Creek is not identified on the 303(d) list or 305(b) report that the CDPHE provides to EPA under the Clean Water Act. The Terror Creek drainage is tributary to the North Fork of the Gunnison River, which is listed on the 2010 303(d) list for selenium (CDPHE, 2010c). According to the most recent update to the Colorado 305(b) report, the leading cause of impairment in Colorado rivers is metals and specifically selenium derived from marine shales (CDPHE, 2010d).

In the project area, the West Fork of Terror Creek is identified as Segment 4 and Segment 5 of the North Fork Basin by the CDPHE-Colorado Water Quality Control Commission (WQCC) (CDPHE, 2010b). Segment 4 includes those portions of the West Fork of Terror Creek that are within NFS lands. Segment 5 includes the reaches of the West Fork of Terror Creek that are downstream of the National Forest boundary. The WQCC has identified designated uses for these segments, which include Aquatic Life Cold (1), Recreation (Existing Primary Contact Use for Segment 4 and Potential Primary Contact Use for Segment 5), Water Supply and Agriculture. These segments are not identified as impaired or requiring monitoring and evaluation on Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List. Table 6 in Appendix F provides a summary of the water quality data at the West Fork of Terror Creek and the identified numeric standards for this waterbody.

In 2003, the U.S. Geological Survey (USGS) completed a study of the streamflow gain-loss in a reach of Terror Creek in the vicinity of current and future mining. The study utilized tracer techniques and also incorporated other streamflow gauges in the study area. The study did not note any significant gains or losses of streamflow in the study reach.

The West Fork of Terror Creek channel contains primarily boulder dominated riffles with some interspersed cobble dominated riffles and small pools (see Figure 7 in Appendix F). Larger pools are found upstream of logjams/beaver dams. The bottoms of these pools have accumulated fine-grained sediments. The West Fork of Terror Creek has an average channel slope of 5.5 percent (see Figure 13 in Appendix F). Typical average channel slopes range from a low of approximately 3 percent to 10.6 percent (based on analysis of 100 foot reaches, see Figure 13 in Appendix F). Light Detection and Ranging (LiDAR) elevation information documents there is significant irregularity in channel slope and characteristics between sections within the LBA tract (see Appendix F) as is typical of a step-pool dominated mountain stream.

West Fork of Terror Creek generally has a 5- to 15-foot wide channel bed that is flanked by steep banks that rise 1 to 3 feet above the channel bottom. In some areas, deeper pools have formed with residual depths of 1.5 to 4 feet. The channel riffles typically had water depths of 0.3 to 1 foot (see photos in Appendix F).

MEC conducted a baseline study of macroinvertebrates within the LBA Tract to determine organism biomass and diversity as an indicator of water quality (WWE, 2013a). Samples of invertebrates were taken at five locations and analyzed in the lab to determine species diversity and biomass. For all sites, the macroinvertebrate metrics indicate very good stream conditions. These baseline results showed that West Fork Terror Creek is in attainment for the aquatic life uses as classified by the CDPHE.

The mean observed water temperature, 8.2°C (46.8°F), is in attainment of the chronic temperature standard. Data from Bowie show that West Fork of Terror Creek temperatures ranged from -0.7°C (30.7°F) to a maximum reported temperature of 26.7°C (80°F), which is well above the standard mean weekly average temperature of 17°C (63°F).

The total suspended solids (TSS) maximum value of 122 milligrams per liter (mg/L) has been reported by Bowie's water quality sampling reports. During WWE's April 2012 site visit, visibility was approximately 2 feet and the water was turbid. During subsequent visits during summer and fall 2012, the creek was typically clear and lacking observable turbidity. The mean reported TSS value of 23 mg/L is consistent with clear water which could support cold-water aquatic life. Generally, TSS and turbidity are positively correlated with stream flow. Relatively higher TSS and turbidity levels would be expected during spring runoff and during years with higher than average flow. Conversely, low flow years, such as 2002, will generally have relatively lower TSS and turbidity.

The North Fork Coal EIS (USFS and BLM, 2000) noted that surface water quality in streams that drain the Iron Point Coal Lease Tract area are relatively consistent. Generally, flows in Hubbard and Terror creeks and the North Fork of the Gunnison River are calcium bicarbonate type water. Four stations: Iron Point Gulch (D34-12), Dove Gulch (D34-15), Lower Freeman Gulch (Free-low), and Lower Stevens Gulch (Steph-low) are calcium/sodium bicarbonate type with high concentrations of TDS. Metals concentrations at these four stations were below detection limits or within the state standards for total iron, manganese, and selenium with one exception: the Dove Gulch station had a concentration of total iron that slightly exceeded the standard in July 1998.

Regional water resources are also summarized in the LHA for the North Fork Area which describes the water sources in the lease area as meeting Land Health Standard 5 (BLM, 2007).

**Groundwater.** Groundwater resources within the area are primarily associated with alluvial deposits, and the direction of flow follows local topography. Generally, this groundwater resource is of good quality, and is used for both human consumption and agricultural purposes. The overburden range in the LBA tract is from about 950 feet to 2,300 feet. There are no groundwater wells within the LBA tract. Three springs, two ponds, and two pipelines are found in the lease tract (see Hydrology/Water Rights section).

A 2005 USGS report on the hydrology of Terror Creek identified that a significant fraction of stream flow can be located in the hyporheic system (Williams and Leib, 2005). The report also identified that Terror Creek has measurable losses of water to groundwater (both in the report's research and as cited from a 1983 study). The report does not identify if losses are into coal seams, geologic fractures, or other unidentified formations.

There is some groundwater associated with bedrock formations, specifically, the Mancos and Mesa Verde formations. This analysis focuses on the Mesa Verde Formation because this is the formation in which mining would occur. Groundwater resources associated with this formation are minimal to moderate and are primarily associated with sandstone members of the formation. Groundwater flow typically follows the dip (5 degrees) of the bed, which trends to the northeast. Groundwater quantities are higher down-bed and lower near outcrops.

Historically, the Bowie No. 2 Mine has encountered very little water in its B-Seam workings (the area where mining is currently taking place). This is due, in part, to the mine's proximity to the formation's outcrop. Through personnel communication with Art Etter, Project Engineer for Bowie, as Bowie constructed the entry mains under Terror Creek and began to mine west of the creek they found that the B seam is essentially dry (Etter, 2012). Groundwater that has been encountered has been within perched water bearing zones associated with sandstones and has been of limited extent. All groundwater intercepted during mining activities either by removing the coal or subsidence is currently being pumped into mined out portions of the mine, a practice that would continue to occur if mining of the lease tract takes place.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Surface-disturbing activities associated with the drilling of MDWs would result in no direct impacts to surface waters; however, activities could indirectly result in increased amounts of sediment being deposited into surface waters due to increased erosion resulting from clearing and grading of MDW pads and the construction and use of access roads. These impacts would be mitigated by design features expected to be employed during construction of pads and roads (see the stipulations under Threatened and Endangered Species). Impacts would be mainly short-term, as roads and pads would be reclaimed. Limited impacts to local perennial streams or aquatic wildlife are expected as a result of the implementation of the Proposed Action.

Impacts to the water resulting from the release of hazardous or solid waste are not expected. The potential for impacts resulting from substance release would depend upon the responsible use of chemicals and the immediate containment and adequate clean-up in the event of unintentional releases. The potential for exposure to hazardous or solid wastes would be low and short-term during drilling activities.

Future mining (likely longwall units) could be conducted beneath three springs, two ponds and two pipelines in the lease tract (see Hydrology/Water Rights section). Subsidence would occur in areas above and adjacent to longwall mining. The amount of subsidence would depend upon many factors, including mine plans, coal seam thickness, geologic strata, and overburden depth. Within the LBA, overburden depth is greater than 950 feet to 2,300 feet (see Geology and Minerals section). Based on these overburden data, the maximum measured vertical displacement, after mining is completed for the LBA, would vary from a maximum projected value of 4.2 feet in the western portion to a maximum projected value of 5.7 feet in the eastern portion. The location of this maximum projected subsidence value is located in the southeast corner of the LBA approximately 300 feet south of the West Fork of Terror Creek (see Appendix F).

The lower-B Seam overburden thickness along the West Fork of Terror Creek channel ranges from about 950 to 1,800 feet. Along the West Fork of Terror Creek, the maximum subsidence is expected to be about 5.1 feet. No reduction in surface flow in the West Fork of Terror Creek resulting from the subsidence in the LBA tract is projected based upon this analysis. The conclusion is supported by analysis with similar, nearby coal mines (Bear Creek and West Elk mines) and the amount and makeup of the colluvium material underlying the West Fork of Terror Creek in the LBA tract.

A sediment transport analysis of West Fork Terror Creek within the Spruce Stomp Lease Area was performed by WWE (2013a). The results of this analysis indicate that the creek generates enough sheer stress under normal high flow conditions to move grain sizes which exceed the average measured grain size. Abundant boulders which armor the creek's bed and banks exceed the particle size that would be moved by normal flows. As it pertains to channel profile changes, the primary concern with water quality would be increased suspended solids. Based on the sediment transport analysis, the magnitude of change to the creek's profile is not expected to be sufficient to elicit a significant change in sediment mobilization, transport or deposition of West Fork Terror Creek. While minor steepening or flattening of the channel may occur and these changes would alter sheer stress, the stream is already capable of transporting much of the sediment located between larger boulders. The projected change in transported grain size would be minimal. Also, following completion of mining and establishment of equilibrium, the subsidence would result in a balanced net change (steepened areas would be equal to flattened areas). Accordingly, reaches that may have slightly more suspended sediment as a result of being steepened may be balanced by reaches that would have slightly less suspended sediment as a result of being flattened (WWE, 2013a).

Physical stream characteristics such as pre-and post-project channel profile, slopes, and surface fracture characterization were also investigated within the LBA Tract area (WWE. 2013a). For channel profile, the West Fork Terror Creek channel currently has an approximate average slope

of about 6 percent within the lease tract area. After mining is completed, the channel profile indicates that the studied portions of West Fork Terror Creek would have a new maximum slope of 7.0 percent, or roughly a 1 percent change.

Subsidence would be most noticeable on ridges and steeper slopes. Tension cracks may appear in bedrock outcrops, on steep slopes, and at the edges of subsidence. These cracks would result from shifts in the relative position of surface materials, and would have no connection to the fracture zone above the gob. Tension cracks could be comparatively deep and conspicuous in bedrock; however, they would not extend deeply below the surface. Tension cracks would not result in any potential drainage of surface water to the gob or contamination of groundwater.

Subsidence from mining could alter surface water hydrology by altering surface water drainage patterns. As discussed above, there is little connection between groundwater flow regimes and surface water hydrology within this area, and no indirect impacts are anticipated. Subsidence under surface-water drainages could result in minor changes in channel morphology and gradient, thereby temporarily impacting water quality by inducing minor cutting, pooling, soil erosion, and sedimentation. Surface-tension cracks have the potential to develop within the surrounding surface drainages, which would result in an initial period of erosion and sedimentation after initial periods of run-off after subsidence occurs. Based upon observations from the Bear Creek and other mines in the area, surface-tension cracks would be small and discontinuous and would not result in any extensive rechanneling or draining of the stream channels. The potential for larger surface fractures to develop in drainages where unconsolidated materials occur would be partially mitigated by the ductile nature of the unconsolidated alluvium and colluvium. Settling and tension cracking of the surface would not impact surface water quantity and would result in only local and short-term impacts to water quality. As noted in the introduction to this section, regular monitoring (quarterly/annual) by the lessee will be conducted as permit conditions by State and Federal agencies to ensure impacts are minor.

Water discharge as a consequence of future mining into surface streams could impact the quality of water in the receiving streams. Mine effluent would be regulated, and any discharge to receiving streams would have to meet permitted effluent requirements. Concentrations of total dissolved solids (TDS), iron, manganese, and sulfate could likely increase. All groundwater intercepted during mining activities either by removing the coal or subsidence is currently being pumped into mined out portions of the mine, a practice that would continue if mining of the lease tract takes place.

The MDW drilling is not expected to cause impacts to either surface or groundwater in the project area. Stipulations associated with soils, hazardous materials, and the cutthroat trout are sufficient to protect the water quality in the West Fork of Terror Creek. The potential effects to groundwater as a result of coal mining that is already authorized, or occurring, on the adjacent leases would not be expected to change as a consequence of mining the sections of longwall proposed for the LBA. Leasing and the subsequent mining of the coal in the LBA would increase the potential for indirect impacts to surface and ground water quality due to related subsidence under perennial, intermittent and ephemeral drainages and to springs/seeps within the area.

## **Cumulative Impacts**

Post-lease surface disturbances associated with mining those lands is estimated to be approximately 45 acres. However, current mining activity at the Bowie Mine has had no discernible localized effects to stream morphology, erosion rate, or suspended sediment load. High flows in intermittent and ephemeral surface water resources in smaller tributary drainages are limited to spring runoff and very large thunderstorm events; therefore, subsidence-induced impacts in these drainages would be minimal.

Due to the overriding influence of continued drought in the North Fork basin and the fact that creek flow is unlikely to be affected by subsidence or mine operations; it is unlikely that water resource allocations for the greater watershed would be impacted.

Potential post-lease surface use (exploration drilling, methane drainage) has the potential to affect surface water through surface disturbance related to drill pad and road construction on both federal coal leases and on adjacent private lands. Depending on location of these activities, construction could have impacts on sedimentation in stream channels; however, these effects are able to be mitigated through use of BMPs, including sediment control. The strata are not uniformly saturated, so there is little concern for inter-aquifer communication for installing methane drainage wells or exploration wells as they would be of small diameter and would cause little disturbance to the geologic strata. Methane release from coal mines would not be expected to impact domestic water wells because the wells are below the coal seams to be mined.

Accidental fuel or solvent spills from post-lease activities or through activities on private lands could impact shallow groundwater locally and surface water. Any proposed post-lease activities related to coal operations would be analyzed under a separate process if/when activities are proposed.

Agriculture is an important and substantial activity in the North Fork of the Gunnison Valley. Cumulative effects to surface water quality would be minimal in the North Fork of the Gunnison River Valley.

Minimal logging is anticipated in this area in the future. Based on experience in the area, impacts to surface water would not be expected from small timber sales. Recreation is fairly limited in the area due to the lack of developed recreational facilities. Hunting is the primary recreational activity in this area, and impacts to streams from four-wheeling activity can result in increased sedimentation and damage to drainage channels.

The potential for cumulative groundwater impacts in the study area is expected to be minimal. In adjacent lands private domestic wells could be drilled and septic systems could be installed. Adjacent private lands could be mined and water resource impacts on those lands would be similar to that described above. Appropriate state and county regulations would have to be followed, minimizing impacts to groundwater quantity and quality.

## **Stipulations**

- None in addition to those in the Geology and Minerals and Threatened and Endangered Species sections.

### **Finding on the BLM Public Land Health Standard for Water Quality**

The proposed lease tract area is identified as meeting Public Land Health Standard 2 for water quality (BLM, 2007). Aquatic habitat is present in Terror Creek and its tributaries. Cutthroat trout are known to be present in the East and West Forks of Terror Creek and are believed to be present in Terror Creek. This species is discussed in the Endangered Species section of this document. Aquatic habitat in Terror Creek is believed to be in good condition, well shaded by riparian vegetation, with stable banks, and a stable substrate. Approximately 2.5 miles of the West Fork of Terror Creek is contained within the proposed lease tract, of which 0.18 mile is on BLM-managed lands. The public lands within the LBA tract would continue to meet the Standards for healthy aquatic plant and animal communities after implementation of the Proposed Action.

### **No Action Alternative**

No surface or groundwater quality impacts would occur as a result of coal mining on the lease tract because the lease would not be issued.

## **WASTES, HAZARDOUS OR SOLID**

### **Affected Environment**

For hazardous wastes, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

The equipment and materials needed under the Proposed Action have low potential for accidental spill of regulated or hazardous waste substance. These materials include motor fuel and drilling fluids (bentonite and benign soaps). The lessee would be required to maintain all of the appropriate Material Safety Data Sheets (MSDS) for all chemicals, compounds, and substances to be used during project activities.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Impacts to the environment resulting from the release of hazardous or solid waste are not expected. The potential for impacts resulting from substance release would depend upon the responsible use of chemicals and the immediate containment and adequate clean-up in the event of unintentional releases. The potential for exposure to hazardous or solid wastes would be low and short-term during drilling activities. Lessee would be required to follow all hazardous material BMPs for their operations.

### **Cumulative Impacts**

Continued mining would produce additional quantities of hazardous and solid waste. These materials would continue to be managed and controlled under current regulations and BMPs. Cumulative impacts would be kept within state and federal guidelines and would be minor. Development of residential and other activities would also generate hazardous and solid wastes. It is expected that the private landowners would contract with private waste management specialists, and the cumulative impacts would be minor.

## **Stipulations**

None in addition to stipulations contained in the Threatened and Endangered Species Section.

## **No Action Alternative**

Under the No Action Alternative, there would be no impacts associated with hazardous or solid wastes from the proposed lease tract because the lease would not be issued.

## **ENVIRONMENTAL JUSTICE**

### **Affected Environment**

Executive Order No. 12898 on Environmental Justice, regarding how federal actions may impact minority and low-income populations, was issued on February 11, 1994. The purpose of the order is to identify and address, as appropriate, disproportionately high and adverse human health and environmental impacts resulting from programs, policies, or activities on minority or low-income populations. U.S. Census Bureau summary data for Gunnison and Delta counties (U.S. Census Bureau, 2008a and 2008b) and 2000 Census data for Census Tract 9639 in Gunnison County (U.S. Census Bureau, 2009) do not indicate that there are ethnic groups or communities or low-income populations within the upper drainage of the North Fork of the Gunnison River area or in adjacent portions of Delta and Gunnison counties that may be impacted by changes in employment at the mine. There are no low-income or minority populations that could be disproportionately impacted by the Proposed Action.

### **Environmental Consequences/Stipulations**

#### **Proposed Action**

There are no environmental consequences associated with Environmental Justice under the Proposed Action.

#### **Cumulative Impacts**

There would be no cumulative environmental justice impacts resulting from continued mining and other rural development in the LBA area.

#### **Stipulations**

None.

#### **No Action Alternative**

Under the No Action Alternative, there would be no disproportionate negative impacts to minority and low-income populations because the lease would not be issued.

## **ACCESS AND TRANSPORTATION**

### **Affected Environment**

For access and transportation, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

Roads and trails on NFS lands are managed through the GMUG Forest Plan, the Gunnison Basin Federal Lands Travel Management decision (July 2010), and Forest Service Handbook (FSH) 7700. Roads and trails are managed to provide public and administrative access and recreational opportunities while protecting the quality of other resources, such as air quality, water quality, and wildlife habitat. Vehicle use on BLM-managed lands is limited to existing routes until further route-by-route planning is completed in the future. Also, public mechanized and motorized travel is limited to existing routes on NFS lands.

The major transportation route in the Paonia and Somerset region is State Highway 133. This highway serves local vehicular and truck traffic for the communities in Delta and Gunnison counties. The highway provides access to the coal handling facilities and existing spur rail line in the area and to surface operations at the Bowie No. 2 Mine and other mines in the North Fork Valley. State Highway 133 is an asphalt, all-weather, two-lane highway which has been periodically upgraded over the past 20 years.

Two roads provide access to the proposed lease. The Terror Creek road is an unsurfaced road that takes off from State Highway 133 on private land, proceeds up Terror Creek on to BLM land, and continues on to NFS lands (FR 824). The Terror Creek road enters the proposed lease tract and would provide access to the MDWs. This is not a public road and has limited access due to locked gates. Any potential Lessee would be required to acquire a BLM right-of-way (see Realty Authorizations section) for that portion of the road on BLM land; they would also need a road-use-permit for use of any system routes on NFS lands.

The proposed lease tract is also accessed from Paonia by Stevens Gulch Road, a public road, which is initially a Delta County road, and is an asphalt, all-weather, two-lane road to the entrance of the closed Bowie No. 1 Mine (approximately 2.5 miles). Beyond the turnoff to the mine, the Stevens Gulch Road is no longer a county road but is an unpaved gravel road (USFS road # 701) leading to the Gunnison National Forest). Delta County maintains the road under agreement with the National Forest. The Forest Service has acquired easements through private land for the public to access the National Forest on FR 701. The road is not maintained through the National Forest in the winter but is used by snowmobile and other over-snow winter access. The overall condition of the Stevens Gulch Road should be considered as fair, and it requires routine maintenance. The road passes through the proposed lease tract and continues onto the Gunnison National Forest.

Two other USFS roads (FR) are located in Township 12 South, Range 92 West, 6<sup>th</sup> P.M. S1/2 of Section 36. FR 701.1A is a short spur road that parallels the West Fork of Terror Creek after leaving the Stevens Gulch Road. FR 703 travels west from the Stevens Gulch Road and then turns south before leaving the NF.

Several other roads have been constructed for past coal exploration activities within the proposed lease. These roads have been reclaimed and do not currently serve as access routes into the proposed lease but could be potentially be reconstructed to serve the project as access to MDW pads. Gates would be placed on these temporary roads to prevent public access and reclamation would be accomplished when the MDWs are no longer needed.

It is assumed that the transportation of mined coal would occur as part of the underground operation for the LBA tract. The coal would arrive at the surface to be handled by the existing coal handling facilities and loaded primarily on trains for delivery.

A very small quantity of coal would be hauled by truck locally in the North Fork Valley. The North Fork Coal EIS (USFS and BLM, 2000) analyzed truck and train transportation in association with mining operations. Transportation of coal to rail is by a conveyor system. This EA is tiered to the analysis in the North Fork Coal EIS (USFS and BLM, 2000).

## **Environmental Consequences/Stipulations**

### **Proposed Action**

No additional demand for transportation of employees to the mine surface operations facilities or coal handling and transport facilities would be required. Mining operations and processing would be extended throughout the period required to mine available coal. The existing use of State Highway 133 as access to the mine operations and facilities would continue at close to the existing rate for an additional 3 to 4 years as a result of developing the Spruce Stomp LBA. It is noted that existing rail transportation constraints currently limit the annual production from the North Fork Valley.

The Proposed Action is expected to result in only a minor and temporary impact on access to the LBA tract. MDW activities would result in approximately 4 miles of new temporary access roads (3 to 4 years) on NFS and BLM-managed lands. These roads would remain open during the mining operations for access by light-duty trucks for regular inspections and maintenance of the MDWs. The temporary roads would be reclaimed after mining activities are completed. Roads constructed or reopened for MDW drilling would be kept closed to the public during MDW drilling and operation and appropriate signage would be used. Activities associated with the Proposed Action would not impact current public access to the proposed lease tract.

Longwall panels would likely be situated under the Stevens Gulch Road. The overburden range is from 1,750 feet to 2,150 feet. At that depth there would be measurable subsidence but no visible surface cracking (see Geology and Minerals section). Therefore, it is expected that there would be no subsidence-related disturbance to the public road in Stevens Gulch with implementation of the stipulations.

Some level of drilling traffic on the Stevens Gulch Road/FR 701 and FR 824 would continue until completion of post-leasing surface uses on the LBA are completed. FR 701 and 824 may be used to access the LBA tract for additional coal exploration drilling, MDW installation, ventilation facilities, etc. There would likely be a small amount of traffic associated with installing water monitoring devices and subsidence monitoring devices, along with trips to take measurements at these locations. Any post-lease surface disturbing activity would be evaluated at the time a site-specific proposal was received through subsequent permitting processes.

The Proposed Action impacts from train transportation in association with mining operations would be expected to be within the impacts evaluated in the North Fork Coal EIS (USFS and BLM, 2000). This evaluation concluded that the Proposed Action would not result in substantial

effects beyond the range of effects already analyzed. The proposed transportation of the coal product was analyzed within the North Fork Coal EIS (USFS and BLM, 2000) and presents no significant change to the federal action within that analysis.

### **Cumulative Impacts**

Cumulative effects in the form of wear and tear, traffic, and safety issues would continue on the existing transportation system from vegetation management activities for wildlife habitat improvements, range management, recreational users, private residences and coal mining.

Future mining operations and other development activities would maintain and, potentially, open new related infrastructure for traffic access. Potential oil and gas development, residential development on private land, and other activities may increase access and road infrastructure in the area. The tax revenue generated from mining and other development would contribute to the maintenance of public roads. The railroad traffic related to mining would not impact other traffic with the continuation of mining activities.

### **Stipulations**

Stevens Gulch Road and other public roads would be protected from surface disturbance and subsidence through the following:

- No mining related disturbance would occur within 100 feet of the outside line of the right-of-way of Stevens Gulch Road. The angle of draw used to protect the road from subsidence would be dictated by the approved Colorado DMG Mining and Reclamation Plan (the estimated angle of draw is conservatively estimated to be 25 degrees). However, mining-related disturbance may occur if, after public notice and the opportunity for public hearing in the locality, a written finding is made by the Authorized Officer that the interests of the public and the landowners affected by mining within 100 feet of the public road would be protected.
- The lessee/operator shall be required to perform the following with respect to monitoring, repairing, and/or mitigating subsidence effects on existing facilities under Special Use Permit with the Forest Service. Monitoring, repair and/or mitigation shall be performed at the lessee's expense.
  - Baseline condition surveys of existing facilities shall be completed the fall following award of lease. Reports of this survey shall be deliverable to the Forest Service by December 1 of that same year.
  - A Surface Facility Monitoring and Mitigation Plan (Plan) shall be submitted to the Forest Service for review and approval not later than 12 months prior to scheduled undermining. The Plan shall detail measures to be taken to monitor, repair, and mitigate subsidence effects on the facilities during actual mining and for one year post mining.
- The lessee/operator shall schedule mining activities such that active subsidence of roads occurs during dormant winter months, unless no other practicable alternative exists.

## **No Action Alternative**

Under the No Action Alternative, there would be no new road construction associated with the lease area. Limited impacts to access and transportation within the LBA tract would occur as Bowie is currently utilizing some of the roads for mining related activity (monitoring, data gathering, access to MDW on existing leases, etc.).

## **REALTY AUTHORIZATIONS**

### **Affected Environment**

For realty authorizations, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

There are three existing rights-of-way on USFS and BLM lands within the lease area:

- Right-of-way COC-66873 is an access road to Bowie Resources, LLC for their mining operations.
- Right-of-way COC-22713, held by WAPA, is a 125-foot wide right-of-way for an electrical transmission line with a capacity up to 345 kV.
- The third right-of-way, COC-73374, is for a stream gauge monitoring station to Bowie Resources.

An additional public use, located on private land, includes the Pitkin Mesa Pipeline which is west of Stevens Gulch Road. The pipeline crosses approximately 6,200 feet on the western side of the proposed lease. The original pipeline was built in 1938 and it collects water from a series of springs located north of the proposed lease tract on the National Forest. The pipeline services approximately 160 domestic water taps on Pitkin Mesa.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Subsidence effects on the 230/345 kV WAPA transmission line could occur. Overburden depth from south to north ranges from approximately 1,100 feet to over 1,500 feet on the north end of the WAPA right-of-way. There is a potential for impacts to the 230/345 kV WAPA transmission line as a consequence of drilling equipment interference with overhead transmission lines or right-of-way access roads from surface drilling operations. There is minimal potential for any impact on future realty actions on NFS and BLM-managed lands.

### **Cumulative Impacts**

Future mining operations and other development activities would maintain and, potentially, require new related infrastructure to support the development. Potential oil and gas development, residential development on private land and other activities may increase the need for infrastructure in the area. There is expected to be minimal impacts due to future realty actions on NFS and BLM-managed lands.

## **Stipulations**

The BLM and the USFS would require the successful lessee to implement the following stipulations (see also Stipulations in Access and Transportation section):

- Electrical safety clearances addressed in the Code of Federal Regulations, 29 CFR 1910.333(c) (3) must be maintained at all times.
- All vehicles, equipment, and/or machinery or other materials near the transmission line must be properly grounded. In order to avoid static or induced electrical hazards no materials may be stored in the 125-foot wide right-of-way.
- If future longwall mining would come within 100 feet of any transmission line tower foundation, a structural review and acceptance by WAPA would be required.
- Any drilling activities within WAPA's right-of-way must be approved by WAPA in advance. Safety provisions would be provided to ensure there are no conflicts with WAPA's transmission line or access.
- The lessee is required to coordinate with WAPA's operations center located in Western Rocky Mountain Region Office in Loveland, Colorado at least two weeks prior to commencement of any work beneath or adjacent to the transmission line.
- Roads used to provide personnel and equipment access to WAPA's facilities cannot be restricted or impaired in a way that denies access. Alternate access must be provided if an access road is blocked or damaged. Damage to WAPA's access roads must be repaired by the lessee or lessee's contractor.
- State-of-the-art mining techniques (pillar and panel widths, rate of coal development and extraction, mine method, determining angle of draw, etc.) would be used to control subsidence. No mining related surface disturbance would occur within 100 feet of the outside line of the power line right-of-way without a written finding from the Authorized Officer and consultation with the right-of-way holder. These techniques would provide for maximum coal removal while insuring that sufficient coal is left in place to prevent subsidence.

## **No Action Alternative**

There would be no impacts to current or future realty authorizations within the lease tract because the lease would not be issued.

## **RANGE MANAGEMENT**

### **Affected Environment**

For range management, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

Management practices involve systematically grazing individual areas and moving livestock between areas to control grazing intensity to prevent over-grazing of any area and allowing forage to recover between annual grazing intervals. Within individual grazing allotments, livestock distribution and grazing utilization and intensity are controlled primarily by fencing, watering sources, salting, the location of livestock trails, and herding the livestock. The management strategy is designed to improve plant diversity, increase vegetative cover, and

stimulate plant vigor by controlling the frequency and intensity of grazing, while providing sufficient opportunity for forage to grow or re-grow between grazing intervals.

The project area straddles two BLM allotments. Stevens Gulch Common (# 14513) is used for cattle and contains 73 animal unit months (AUMs). Upper Terror Creek (# 14514) is also used for cattle and has 59 AUMs. There is no sheep grazing within the project area on BLM-managed lands. There is a grazing strategy for Stevens Gulch Common but none for Upper Terror Creek, as it is used to trail cattle to and from the adjacent NFS lands.

The NFS lands are within the East Terror Cattle & Sheep allotment (allotment #801). Grazing on the allotment is authorized for both cattle (500 cow/calf pairs) and sheep (800 ewe/lamb sheep). The allotment is grazed using rotational grazing strategies. The rotational grazing strategies provide rangeland vegetation the opportunity to grow before being grazed and/or re-grow after being grazed. Grazing in the project area varies annually, depending on the rotation schedules. The grazing season is June 26 to October 5. The Forest Service and permit holders meet each spring, prior to the beginning of the grazing season, to establish the sequence and duration of grazing for each grazing unit for that annual grazing season.

The East Terror allotment has four pastures for cattle grazing. Cattle graze from 14 to 48 days in each pasture. The sheep graze in the two upper pastures, and their rotation is based on sheep camps. There are five sheep camps on the East Terror allotment. Sheep are grazed in the vicinity of each sheep camp and moved to the next sheep camp/area. Grazing use varies from 4 to 14 days per sheep camp/area. The sheep graze each area one time during the season.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Subsidence of the land surface could have minor effects on range improvements. Depending on the location of existing stock ponds in relation to mine operations plan configuration, there is potential for surface tension cracks to form near or under a specific stock pond. These cracks could disrupt springs or the surface runoff patterns that feed the ponds, or damage the ponds themselves. A stipulation in the realty authorization section will require that a Surface Facility Monitoring and Mitigation Plan be submitted to the Forest Service for review and approval not later than 12 months prior to scheduled undermining. The Plan shall detail measures to be taken to monitor, repair, and mitigate subsidence effects on the facilities during actual mining and for one year post mining. This plan should provide the specific details on livestock grazing facilities that will require monitoring and possible future actions if damage does occur.

Based on past observations in the Somerset, West Elk and Bowie No. 2 mine areas, no permanent loss of flow is predicted when longwall panels are mined in the lower B-seam beneath the West Fork of Terror Creek even if bedrock was exposed in the stream bed. If alluvium and colluvium is present, these materials would fill any near-surface cracking that could develop which would further reduce potential loss of flow. Past drilling near the West Fork of Terror Creek has shown that the surficial material (alluvium and colluviums) is greater than 40 feet in thickness at the points drilled. Surficial material measured at the drill sites was greater than 85

feet thick near the confluence of the West Fork of Terror Creek and Terror Creek (see Appendix F).

Any damage to stock ponds would likely be localized and readily repairable. Because of the thick overburden present and because the springs occurring in the LBA tract issue from alluvial/colluvial deposits, there is low risk of the springs that feed stock ponds being intercepted by subsidence induced tension fractures.

Any effects to existing water sources that support grazing activities would change livestock distribution on the allotment. Stipulations that would require monitoring of the stock ponds in the LBA and requirements for repairing the facilities or replacing water would alleviate these impacts. If post-lease surface use such as exploration or methane drainage drilling occurred, cattle would likely be displaced during the construction of the roads and drainage wells, thereby putting more pressure on the other pastures in the allotment. In addition, cattle could be excluded from reclaimed areas as vegetation established. If any fences or gates are constructed there may be a chance that these gates would be left open and cattle would migrate off of their specific grazing areas, disrupting planned grazing rotation. People in vehicles associated with drilling activities could push cattle outside their prescribed allotment.

Potential surface use areas would temporarily remove vegetation and livestock forage but with successful reclamation disturbed areas would likely regain a healthy herbaceous-dominated state. After an estimated two to three growing seasons, forage levels could return to pre-construction levels on the reclaimed ground. In some cases post-disturbance forage levels are improved over pre-existing conditions due to remove of woody species. Generally, surface disturbance and vehicular travel on grazing allotments also presents the opportunity for the introduction and spread of noxious weeds. Stipulations to prevent the spread of noxious weeds are presented in the Invasive Species section above.

### **Cumulative Impacts**

Sustainable grazing is anticipated to continue, as practiced, and vegetation communities are not expected to be altered by this practice. There may be local displacement of vegetation communities as a result of continued dispersed residential and forest management activities.

### **Stipulations**

The BLM and the USFS would require the following:

- Any construction/operation impacts man-made barriers to livestock movement shall be mitigated by replacing fences, gates, cattle guards, and gates to at least the same condition as they were found before construction, and installation of new fences where needed.

### **No Action Alternative**

Under the No Action Alternative, existing livestock grazing would continue in the area without change. Range management practices would continue to be implemented on an annual basis. Any existing range improvements would be unaffected under this alternative. There would be no impacts to current or future rangeland management in the lease tract because the lease would not be issued.

## **WILDFIRE**

### **Affected Environment**

For fire management, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

Warm, dry summers experienced in the LBA tract contribute to a moderate to high risk of wildfire, depending upon specific meteorological conditions. There are no known recent wildfires within the LBA tract or immediate vicinity.

### **Environmental Consequences/Stipulations**

#### **Proposed Action**

Potential wildfire hazards resulting from the implementation of the Proposed Action would be low to moderate. Drilling crews would be required to be equipped with appropriate fire-suppression devices designed to respond to project-related fire starts. Equipment would only be operated on roads and drill pads, which would reduce the risk of fire ignition resulting from vehicle use and MDW pumps. Drilling crews would have access to telephones to facilitate calls to Montrose Interagency Fire Dispatch in order to report naturally-occurring wildfires.

#### **Cumulative Impacts**

Fire risk and changes to the vegetation communities are not expected to be altered by the continued coal mining in the area. Fire risk may increase slightly due to local displacement of vegetation communities as a result of continued dispersed residential and forest management activities. The potential for methane wells to ignite both at the surface and underground exists and could elevate the risk of wildfire while the MDWs are in use.

#### **Stipulations**

None.

#### **No Action Alternative**

Under the No Action Alternative, there would be no project-related impacts to the risk of wildfire because the lease would not be issued.

## **HYDROLOGY/WATER RIGHTS**

### **Affected Environment**

For hydrology and water rights, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

Water resources in the West Fork Terror Creek watershed include the West Fork of Terror Creek, Holy Terror Reservoir, the Overland Ditch, and tributaries to the West Fork of Terror Creek including Cunningham Creek and other unnamed “blue line” features identified on the USGS 7.5-Minute Topographic Quadrangle mapping for the area.

The Overland Ditch intercepts natural surface flows from the upper third of the West Fork Terror Creek watershed when it is in priority (i.e., a downstream water right owner has not placed a “call” on the water). The Overland Ditch is legally able to intercept surface flow until late June or early July during most years. Additional capture and export of water from the West Fork Terror Creek watershed is achieved at the Holy Terror Reservoir, which is located near the headwaters of the watershed. This reservoir captures water from the uppermost portions of the West Fork Terror Creek watershed and diverts it north to the Leroux Creek watershed.

Hydrologic data from the USGS, Bowie, and others identify typical and dry-year flows in the West Fork of Terror Creek. Stream flows in the West Fork of Terror Creek are highly variable depending on season and year (see Figures 11 and 12 and Table 6 in Appendix F). In addition to climatic influences, the West Fork of Terror Creek flows are manipulated by trans-basin diversions (Holly Terror Reservoir) and tributary wells that collect water and transport it out of the watershed (see Figure 8 in Appendix F). Based on direct measurements, average daily mean flows are highest in March (19.9 cubic feet per second [cfs]) and are lowest during late summer and early fall (approximately 1 cfs in July, August, and September). Based on an analysis of diversion records and USGS flow measurements, dry-year conditions can result in flow reductions in the West Fork of Terror Creek of 70 percent or more compared to average conditions during late summer months when flows are at or near their lowest monthly levels.

West Fork of Terror Creek can have short, extreme high flow events that are reportedly capable of overtopping the culvert at the Terror Creek road and would not be measurable with the current staff gauge at this location. In order to overtop the culvert at the Terror Creek road, flows would be in excess of approximately 230 cfs (based on hydrologic modeling at this location). This type of flow in the West Fork of Terror Creek channel would cause scouring, sediment transport, and movement of large rocks and boulders, all of which would result in significant aquatic habitat disturbance.

**Water Rights.** Table 19 provides the water rights associated with the lease tract.

**Table 19  
Water Rights Associated with the Proposed Action**

Location	Section Qtr/Qtr	Water Source	Water Right Name	Water Right ID	Structure	Uses
12S 91W	32, SWNENW	Terror Creek	Garvin Mesa Pipeline Co	1616	Spring - Is in seep area has several points of diversion	Domestic
	30	W. Terror Creek	USFS	2043311066	E. Terror 23 - storage	Livestock
	31	W. Terror Creek	USFS	2043311067	E. Terror 13 - storage	Livestock
	31	W. Terror Creek	USFS	2043311069	E. Terror 11 - storage	Livestock
	31	W. Terror Creek	USFS	2043311068	E. Terror 12 - storage	Livestock
	31	W. Terror Creek	USFS	2043311199	Monte - storage	Livestock
	32	E. Terror Creek	USFS	2043311076	E. Terror 9 - storage	Livestock

Location	Section Qtr/Qtr	Water Source	Water Right Name	Water Right ID	Structure	Uses
	32	E. Terror Creek	USFS	2043311075	E. Terror 10 - storage	Livestock
	32, SWSWSE	Terror Creek	Hughes Pipeline	1663	Pipeline	Domestic, stock
13S 91W	5, NENWNW	Terror Creek	Hughes Family Pipeline & Spring	6241	Spring, Pipeline	Domestic, Stock
	5, NENENW	N Fork Gunnison River	Reds Spring and Pipeline	6222	Spring, Pipeline	Domestic, Stock, Wildlife
12S 92 W	36	W. Terror Creek	USFS	2043311262	Flat - storage	livestock

## Environmental Consequences/Stipulations

### Proposed Action

Future mining (likely longwall units) would be conducted beneath the West Fork of Terror Creek, three springs, two ponds and two pipelines in the lease tract. The overburden range is from about 950 feet to 2,300 feet. It is likely that the longwall mining would be located beneath the West Fork of Terror Creek. Overburden depth above the West Fork of Terror Creek stream channel ranges from about 950 feet near the confluence with the main (or east) fork of Terror Creek to about 1,780 feet.

Under the concept of uniform longwall extraction and related uniform down-warping of the overburden rocks and unconsolidated material as lateral constrained plates, cracks in zones under tensile stress decrease in width with depth, and close at the neutral surfaces. Below the neutral surfaces, the materials are in compression (under compressive stress) (see Figure 1 in Appendix F).

This concept has an important bearing on the hydrologic impacts of mining beneath streams or water-bearing zones located in the continuous deformation zone or near-surface zone. Any surface water or groundwater is prevented from moving downward beyond the neutral surface of a rock unit deforming as a constrained plate. Field observations over a 17-year period in the nearby West Elk mining area have verified this conceptual model in laterally constrained bedrock and surficial material (colluvium, alluvium, mudflow, and debris flow deposits).

If alluvium and colluvium are present, these materials fill any near-surface cracking that may develop which further reduces potential loss of flow. Past drilling near the West Fork of Terror Creek has shown that the surficial material (alluvium and colluviums) is greater than 40 feet in thickness at the points drilled. Surficial material measured at a drill site was greater than 85 feet thick near the confluence of the West Fork of Terror Creek and Terror Creek. The maximum subsidence under the West Fork of Terror Creek is expected to be about 5.1 feet (see Geology and Minerals section). Based on past observations in the Somerset, West Elk, and the Bowie No. 2 mine areas, no permanent loss of stream flow is predicted when longwall panels are mined in the lower B-seam beneath similar creeks even if bedrock were exposed in the stream bed.

Therefore, it is also expected that there would be no subsidence related disturbance to the springs, pipelines, and ponds and the West Fork of Terror Creek.

The existing channel has a maximum slope of 7.3 percent and a minimum slope of 3.0 percent. It is projected that the post mining channel profile would have a new maximum slope of 7.0 percent and a minimum slope of 3.5 percent between the established stations (see Figures 14a – 14g in Appendix F). Based on existing topography and geologic modeling, a maximum estimated 5.1 feet of subsidence along the West Fork of Terror Creek channel is expected to create no more than a 1.5 percent channel slope change. The area adjacent to the creek generally consists of steep terrain (often in excess of 25 percent slopes). Therefore, the expected change in channel slopes is expected to be mostly, if not completely, imperceptible without the aid of survey equipment.

**Water Rights.** While there are no expected effects to water rights, additional analysis of water right impacts would be addressed by DRMS during their mine plan review process.

### **Cumulative Impacts**

Mining activity in the Terror Creek watershed and Bowie's adjacent leases would continue, and groundwater would continue to be intercepted with minimal expected impacts. Other activities associated with residential development, oil and gas activities, and recreation use may put additional demands on water resources within the area and especially groundwater used for development of commercial or residential property.

### **Stipulations**

Stipulations for hydrologic resources and water rights are normally addressed as part of the DRMS mine plan review process. See Geology and Mineral section for stipulations related to hydrologic resources.

### **No Action Alternative**

Under the No Action Alternative, there would be no project-related impacts to water rights or hydrologic resources because the lease would not be issued.

## **NOISE**

### **Affected Environment**

For noise, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

Noise has been recognized as a health hazard with the potential for causing hearing damage. Efforts by industry and regulatory actions have lessened the likelihood for hearing damage occurrence.

The secondary impact associated with noise is the nuisance effects of noise that include interference with speech, unsettling environment at home, work, recreation and other natural environment disruptions. Background noise levels vary greatly due to location and distance from working equipment. There are many factors that determine whether an increase in the noise

level above the existing background is audible. The most important factor is the nature of the new noise source as compared to the nature of the background noise. In some cases a relatively small increase in noise levels caused by mechanical equipment would be noticeable.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

From the surface, the mining of the coal does not create any noise disturbance. However, the noise generated from construction and drilling equipment in adjacent areas would be noticeable. Typically, the noise emissions as a result of adjacent surface facilities for the underground mines would not be expected to be a general nuisance to nearby towns and residents or within the lease area. The Bowie No. 2 Mine surface facilities are located 3 miles from the community of Paonia, and noise control measures include maintenance of existing equipment and screening to contain, or deflect, noise. Impacts would occur locally associated with MDW well pump operations on the lease area. It is possible that under certain meteorological conditions with quiet background, that noise from the surface facilities of the mine could be audible approximately 2 miles away (USFS, 2011). Most of the noise from the surface facilities at the mine would be blocked by topographic features.

### **Cumulative Impacts**

The principal noise sources related to the continued mining operation of the surface facilities include the ventilation fans, MDW pumps, trucks, conveyors, loadout equipment, and trains in the area. Surface disturbance and noise from MDW's construction and use over the life of the LBA could diminish types of recreation for some users, and may impact some wildlife. However, recreational use is low in this area except during hunting season. The dispersed residential development, oil and gas activities, and other recreation activities would also impact background noise levels, due to the increased human presence in the area.

### **Stipulations**

The BLM and the USFS would require the following:

- Noise reduction mitigation shall be utilized on the individual MDW pumps to reduce impacts from their operation and comply with state and federal standards.

### **No Action Alternative**

There would be no additional noise impacts in the project area from activities associated with the lease tract because the lease would not be issued.

## **RECREATION**

### **Affected Environment**

For recreation, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

There is some dispersed recreational use on the LBA tract; however, there are no developed recreational facilities operated by the Forest Service or BLM. The most recreational use occurs during hunting seasons. Other dispersed recreational activities occur in the area including OHV riding, personal firewood gathering, and mountain biking. There is also a limited amount of snowmobiling. The recreational opportunity spectrum for the area is semi-primitive motorized. There are no BLM- or USFS- managed and maintained recreation trails in the LBA tract. OHV and snowmobile users generally ride on NFSR 701, 703, and 824. Some motorized recreation also occurs on the remains of reclaimed drill roads from the 1970s and 1990s.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Under the Proposed Action, dispersed recreation activities would likely be impacted during the assumed surface activities. The disturbance within the proposed lease area would likely limit recreational use within the LBA tract and the immediate surroundings temporarily. Recreational use of lands within active operational portions of the proposed lease would temporarily be displaced until completion of activities.

Adverse indirect impacts on the recreational experience near the proposed lease, including hunting, hiking, camping, biking, and birding, would possibly be caused by elevated noise levels and a general increase in human activity and traffic stemming from construction activity associated with MDWs and access roads. Elevated noise levels during construction would be temporary and would diminish with distance from the construction sites. As a whole, impacts to recreation would be localized and short-term.

### **Cumulative Impacts**

The mining activities may result in a temporary change in recreation activities within the LBA area or surrounding areas of the Terror Creek watershed. Recreational use is expected to continue and/or increase in the future with residential development, ATV use, and hunting activities.

### **Stipulations**

None in addition to those discussed in the terrestrial wildlife and noise sections.

### **No Action Alternative**

Under the No Action Alternative, there would be no project-related impacts to recreation resources because the lease would not be issued.

## **VISUAL RESOURCE MANAGEMENT**

### **Affected Environment**

The project area and cumulative effects study area for visual resources includes the viewsheds potentially affected by the mining activities associated with the Proposed Action. This area is defined as the Spruce Stomp LBA. Based on the Forest Service's prior Visual Management System, land managers determined Visual Quality Objectives (VQOs) for the 1983 Forest Plan.

Since then, the Forest Service has changed to the Scenery Management System (Agricultural Handbook 701).

The Scenery Management System provides a framework for the orderly inventory, analysis, and management of scenic resources. It presents a vocabulary for managing scenery and a systematic approach for determining the relative value and importance of scenic resources on national forests. Key elements of the system include Landscape Character, Scenic Attractiveness classification, Scenic Integrity, constituent Concern Levels, and Distance Zones. Visual impacts to the LBA will be analyzed based on whether a visual impact is able to be detected from the travel-ways within the LBA and whether or not the viewshed meets the area's scenic integrity objectives.

The LBA tract is located in Delta County, generally north and east of the town of Paonia. The primary sensitive viewing area is State Highway 133 and the community of Paonia. Some motorists exposed to the landscapes would have a concern for scenic quality and would be sensitive to modifications to the landscape. With the exception of dispersed recreation activities (primarily hunting and camping), the public does not visit other areas within, or near, the proposed lease. Most of the tract is on upper slopes and relatively level terraces that are more than 1,000 feet higher in elevation than Paonia and the highway and are not within the viewsheds.

**Landscape Character.** Landscape character expresses the visual image of a geographic area and consists of the combination of physical, biological, and cultural attributes that make each landscape identifiable or unique. The term delineates landscape attributes that distinguish an area. The landscape character of the LBA tract is generally natural appearing with interspersed Forest Service roads and livestock management facilities such as fences, water tanks, and corrals. Tree cover patterns help shield the access/road and adjacent mining activities, creating a visual combination of rock, water, and trees, which make up the aesthetic qualities of the area. The existing access roads are the predominant man-made feature of the landscape on the LBA tract.

**Scenic Attractiveness and Scenic Integrity.** Scenic Attractiveness is a class rating of the relative scenic value of a landscape. The Forest Plan assigned the VQO of Modification to the majority of the LBA tract. The VQOs can be translated into the Scenery Management System as having low scenic integrity for modification, which is defined in the Agricultural Handbook 701 as:

- low scenic integrity appears moderately altered, and
- moderate scenic integrity appears slightly altered.

**Concern Levels and Distance Zones.** The LBA tract is not directly visible from public highways, including the Grand Mesa Scenic and Historic Byway and the West Elk Loop Scenic Byway, both Concern Level I (high) travel-ways. The major transportation route in the Paonia and Somerset region is State Highway 133. This highway serves local vehicle and truck traffic for the communities in Delta County, including providing access to the coal handling facilities, existing spur rail line in the area, and to operations at the Bowie No. 2 Mine in the North Fork Valley. The Forest Service and BLM roads in the area are secondary travel-ways and low use areas. FR 701 traverses through the middle of the LBA tract. A little more than half of the LBA

tract is Concern Level 2 (medium) because it can be seen from a road transecting the LBA; the rest is level 3 (low). The Concern Level 2 areas are seen in the foreground (within ½ mile of the road) and the middle ground (between ½ and 4 miles of the road). The concern level 3 areas are in the background (more than 4 miles from the road).

The BLM has inventoried visual resources within the area with the Visual Resource Management (VRM) system. The BLM recently conducted an updated visual resource management inventory. The proposed affected area falls within a Class III objective in the inventory. Class III objective is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. In the Uncompahgre RMP, the proposed lease tract is in BLM's Management Area 7. The RMP provides management direction for Management Area 7, which is managed primarily for coal development.

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Under the Proposed Action, the lease would be approved and offered for competitive bid, and mining activities could occur under the area. Visual impacts would be limited because underground access to the mine would most likely be via existing Bowie No. 2 Mine. The mining activity would likely lead to subsidence. The subsidence report does not indicate any major visual impacts would be expected from mining, subsidence, or tension cracks related to the Proposed Action. There would be little to no visual impact on the area because the size of the cracks would not be visible from any travel-way, limiting access to the viewshed. There is the slight increase in the possibility of a landslide; however, since landslides occur naturally within the project area and the landslide would be not be a dominant feature of the viewshed, the impact on visual quality would be minimal.

Post-lease surface disturbance would be short-term impacts to the visual character of the landscape from drill pad construction, MDW drilling, and access roads. These impacts would be temporary. The dust from construction activities and the sight of vehicles on access roads used for the transport of equipment and workers would be visible until construction activities are completed.

Long-term impacts associated with the implementation of the Proposed Action would result from the addition of temporary wellhead structures to the landscape and from the operation of ventilation pumps. The surface disturbance and aboveground facilities associated with the project would be located on flat terraces or on drainage slopes that do not face towards the highway or toward Paonia. All surface facilities would be higher in elevation than the viewpoints, with a very low profile that would not intrude into viewsheds. It is anticipated that if any drill pads face sensitive viewing areas they would have minimal to no cut-and-fill slopes.

Lighting on MDWs would alter the nighttime visual setting temporarily during drilling and drainage operations. Additional and/or new light sources could attract the attention of the casual observer.

### **Cumulative Impacts**

Dispersed residential, oil and gas development, and other utility development activities could impact visual resources. The houses, roads, and utility infrastructure could alter the visual character of the landscape. These developments on private land are not subject to VRM management guidelines. Oil and gas, coal, utilities, and other development on public lands would be subject to visual resource guidelines.

### **Stipulations**

None.

### **No Action Alternative**

Under the No Action Alternative, there would be no project-related impacts to visual resources because the lease would not be issued.

## **PALEONTOLOGY**

### **Affected Environment**

For Paleontology, the impact area is the LBA tract area. The cumulative effects analysis area includes the existing Bowie No. 2 Mine leases and permit area.

Exposed bedrock within the LBA tract consists predominantly of the Cretaceous Mesa Verde Group. Residuum and colluvium of the Tertiary-age Wasatch Formation are also present. Both of these formations are ranked as Class 5 formations (very high potential to yield scientifically significant fossils) under the BLM's Potential Fossil Yield Classification (PFYC) System (U.S. Department of Energy - DOE and BLM, 2008). Mammalian taxa are most common in the Wasatch Formation of the southern Piceance Basin and include representatives of the following fossil orders: Pantodonta, Condylarthra, Primata, Taeniodontia, Multituberculata, Rodentia, Tillodontia, and Perissodactyla (Lucas, 1998). Reptiles, amphibians, invertebrate, and plant fossils are also found in the Wasatch Formation. The Mesa Verde Group contains dinosaur, mammal, reptile, crocodile, turtle, invertebrate, and plant fossils (BLM, 2005).

### **Environmental Consequences/Stipulations**

#### **Proposed Action**

Under the Proposed Action, scientifically important paleontological resources could be destroyed during road and pad construction, as well as during MDW drilling. Coal, although the remains of ancient vegetation, is not considered a scientifically important fossil.

#### **Cumulative Impacts**

The cumulative impacts resulting from the continued underground mining in the LBA area would primarily be due to the removal of large amounts of coal. Paleontology resources in the

overburden of the coal would subside in place. Subsidence would be expected to be relatively uniform over large areas. The impacts of subsidence may include lowering elevations over subsided areas. Dispersed residential and other development activities would result in only localized impacts to paleontology. The overall cumulative impacts of these developments would be minor.

## Stipulations

The BLM and the USFS would require the following stipulations:

- The lessee or operator shall immediately bring to the attention of the FS and BLM any cultural or paleontological resources or any other objects of scientific interest discovered as a result of surface operations under this lease, and shall leave such discoveries intact until directed to proceed by FS and BLM.

## No Action Alternative

There would be no project-related impacts to paleontology resources in the lease tract area because the lease would not be issued.

## SOCIOECONOMICS

### Affected Environment

The area of influence for the social and economic elements of this EA includes Delta County in west central Colorado. Delta County is the area of influence for the population and demographic component because the majority of employees at the coal mining facilities and their families live within the communities in its jurisdiction. Baseline data for Delta County in the area of influence include population and demographic data as well as current business and economic information.

**Population.** Table 20 presents basic population and demographic information for Delta County and the State of Colorado.

**Table 20**  
**Population Characteristics, Delta County and the State of Colorado**

Population	Delta County	Colorado
2000 <sup>1</sup>	27,834	4,302,015
2010 <sup>2</sup>	30,952	5,029,196
% Change, 2000 – 2010	11.2%	16.9%
2012 <sup>3</sup>	30,432	5,187,582
% Change, 2010 - 2012	-1.7%	3.1%
Male (2011) <sup>3</sup>	50.2%	50.2%
Female (2011) <sup>3</sup>	49.8%	49.8%
Under 5 years (2011) <sup>3</sup>	5.3%	6.7%
Under 18 years (2011) <sup>3</sup>	21.6%	24.0%
65 years and over (2011) <sup>3</sup>	21.0%	11.3%
% Minority (2011) <sup>2</sup>	17.3%	30.3%
Below Poverty Level (2007-2011) <sup>3</sup>	14.1%	12.5%
Source:		
<sup>1</sup> U.S. Census Bureau, 2001.		
<sup>2</sup> U.S. Census Bureau, 2011.		
<sup>3</sup> U.S. Census Bureau, 2013.		

Delta County comprises 1,142 square miles with 27.1 people per square mile and a total population of 30,432 people in 2012. Delta County's population grew by approximately 11 percent between 2000 and 2010, and is estimated to have contracted approximately 2 percent between 2010 and 2012. Between 1970 and 2010, Delta County grew at an annual average growth rate of 1.8 percent, which was slightly slower than the average annual statewide growth rate of 2.1 percent during this time. The median age in Delta County is 45.6 years, with 22 percent of the population under the age of 18 and 21 percent at 65 years of age or older. Nearly 87 percent of the people age 25 and older in Delta County have graduated from high school and 18 percent have graduated from college (U.S. Census Bureau, 2013).

The Town of Delta is the largest town in Delta County with a 2011 population of 8,769, an increase of 37 percent since 2000. Other communities in the county include Cedaredge (2011 population of 2,208), Crawford (2011 population of 422), Hotchkiss (2011 population of 930), Orchard City (2011 population of 3,061), and Paonia (2011 population of 1,424).

**Economic Resources.** In 2012, the mining sector employed 760 workers, and accounted for approximately 9 percent of total wage employment in Delta County (wage employment excludes proprietors and self-employed individuals). Average 2012 wages of \$69,455 in Delta County's mining sector were more than twice the average wage level of \$33,228 for other employment sectors in the county (Colorado Department of Labor and Employment, CDLE, 2013). The unemployment rate in Delta County was 8.3 percent in 2012, which was comparable to the statewide average of 8.0 percent for the same period (U.S. Bureau of Labor Statistics, 2013).

The coal mines in Delta County are located in the North Fork Valley. This area includes the towns of Hotchkiss, Paonia and Crawford, which provide many of the mining services, retail, business, and consumer service establishments that serve the mine and its employees. Collectively, the North Fork coal mines provide approximately \$60 million in direct economic benefits to the region (North Fork Valley Network, 2013).

Each mine employed an average of 300-375 full and part time workers (Mine Safety and Health Administration, 2013). Each mine spends many dollars locally for materials, supplies, and services. Each mine also contributes royalty and tax payments to the local and national economy.

**Housing Resources.** In 2011 there were 14,692 housing units in Delta County that housed 12,660 households. Households had an average of 2.3 persons. Delta County had a home ownership rate of 74.6 percent in 2011, well above the state average of 66.8 percent. The median value of an owner occupied housing unit in Delta County was \$198,400, approximately 16 percent lower than the state average of \$236,700 (U.S. Census Bureau, 2013).

**Fiscal Resources.** The federal government receives annual payments from coal lease holders based on rents of 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 C.F.R. 3473). Royalties from federal coal are distributed in the following way: 51 percent returns to the federal treasury in the general fund and 49 percent is returned to the State where the coal was mined. The largest share of Colorado's FML royalties is distributed to school districts and higher education programs across the state. Other portions of the state's FML royalties are

disbursed to counties, cities and school districts in counties impacted by mineral development, and to the Colorado Water Conservation Board for funding local water supply development projects.

Delta County receives a portion of the severance taxes that are paid on coal production within the county, and a portion of the federal mineral royalties that are paid on coal production on federal lands within the county. Property taxes are one of the largest sources of revenue to Delta County government. In 2012, residential property generated 47 percent of the county's total property tax revenue, commercial property generated 20 percent, agricultural property generated 12 percent, state assessed property (utilities and railroads) generated 10 percent, natural resources (including coal production) accounted for 6 percent, and industrial and vacant lands accounted for 5 percent. Schools receive approximately half of the property taxes paid in Delta County, the county government receives approximately 26 percent, special districts (including fire protection, water conservation, hospital, and library districts) receive approximately 22 percent, and towns receive approximately 2 percent (Delta County, 2012).

## **Environmental Consequences/Stipulations**

### **Proposed Action**

Assuming that Bowie was the successful bidder for the new lease, and that the existing Bowie No. 2 Mine facilities would be used, the Proposed Action is not expected to increase operational employment levels at the Bowie #2 Mine. Under the Proposed Action, mining the coal reserves in the Spruce Stomp lease would extend the life of the Bowie No. 2 Mine for approximately 16 to 18 months. During this time, the local economy would be stimulated by the direct spending of the mine and its employees, and the indirect spending of businesses that support the mine and its workers. A temporary increase in employment would be expected due to the construction workforce needed to build the MDWs. Construction workers are expected to come from Delta County.

The Proposed Action is not expected to have an effect on local or regional population trends, or to create an additional demand for housing or municipal services. Under the Proposed Action, the federal government would receive rents and royalties, and the State of Colorado would receive severance taxes, associated with mining coal in the lease. Delta County would receive a portion of these severance tax and federal royalty payments, as well as property taxes paid on coal production and real and personal property at the mine.

### **Cumulative Impacts**

The cumulative socioeconomic effects of continued mining would include a constant level of employment and tax revenues during the operation of the mine and the removal of that source of income when the mine is closed. Residential and other development activities would increase the local population and infrastructure in the area. The cumulative social and economic effects of past, present, and reasonably foreseeable actions in the North Fork of the Gunnison River Valley relative to coal mining operations would be to extend the mining employment sector proportionately to the length of the remaining reserves.

## Stipulations

None.

## No Action Alternative

If the lease tract is not issued, coal mining at the Bowie No. 2 Mine would continue at existing rates until existing reserves are depleted. At that point, employment at the mine, which accounts for approximately 40 percent of the employment in Delta County's mining sector, would end. An estimated 8.02 million tons of recoverable federal coal would be bypassed. The local economy would be likely to contract due to the reduction in mining jobs and associated salaries, and reduced spending by the mine and former employees. A sustained loss of employment would depress the housing market. The federal government would not receive the rents and royalties associated with mining coal in the Spruce Stomp lease, the State of Colorado would not receive severance tax from coal production, and Delta County would not receive property tax associated with mining the coal in the lease.

## CUMULATIVE IMPACTS

Cumulative impacts for each element or resource are discussed within each of the sections above. Cumulative impacts are the environmental impacts that could result from the implementation of the Proposed Action, when added to the impacts from all other past, present, and reasonably foreseeable activities, regardless of who is conducting such activities. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. The cumulative effects analysis considers the geographic scope of the cumulative effects and past, present, and reasonably foreseeable actions. Geographic scope may vary by resource and will be described within that cumulative impacts section for that specific resource if different than that described below.

For this project that geographic scope is focused upon the expanded watershed area 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 back towards the town of Delta. This area is approximately 566,700 acres in total with National Forest being 57 percent (322,400 acres), BLM 11 percent (61,150 acres), and private land 32 percent (182,150 acres). A portion of the private land has the mineral estate reserved to the United States in the patents. This expanded watershed area does not apply to each resource discussed in the EA. The introduction to each resource section provides a discussion of the direct, indirect, and cumulative area for impact assessment.

**Past Actions.** The primary existing (past) disturbances within the area of the proposed lease by application 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 (Orchard Valley Mine).

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 by application area include:

- 59 total wells drilled. 26 are on private surface/private minerals; 13 are split-estate wells (private surface, federal minerals); 20 are on U.S. Forest Service surface; and no wells are on BLM surface.
- 20 wells are producing, 34 are capable of producing but are shut-in, and 5 are temporarily abandoned.
- Total disturbance includes:
  - Well pads – approximately 135 acres.
  - Pipelines – approximately 76.4 acres.
  - Roads – approximately 129.6 acres.
  - Facilities – approximately 48.1 acres.
  - Total disturbance – 389.1 acres (average disturbance per well – 6.8 acres).

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.

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

Mining

Table 21 contains recent production data for the three coal mines in the North Fork Valley.

**Table 21**  
**Raw Coal Production – North Fork Valley – BLM UFO**

<b>*Average based on:</b>	Bowie	Elk Creek	West Elk	Totals (NF)
<b>5 Yr</b>	2,344,044	4,138,654	5,647,850	12,130,549
<b>1 Yr</b>	3,945,664	2,958,019	6,870,157	13,773,840
* Periods end Dec. 31, 2012				

NOTE: The total yearly production for the North Fork Valley is expected to remain about the same -- between 12 and 14 million tons. 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 Mine 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 with a loadout northeast of Paonia.
- The Elk Creek Mine is a longwall operation north of Somerset, operated by Oxbow Mining, LLC, with a loadout immediately north of Somerset.
- 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. The mine is about the 7<sup>th</sup> 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.

#### Oil and Gas Leasing

There are approximately 418,469 total acres of federal oil and gas mineral estate within the cumulative impacts area. Overall, there are 173,646 acres currently leased.

#### Other

- 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, picnicking, horseback riding, snowmobiling, mountain biking and sight-seeing.
- Forest treatments timber sales have been limited in the area.
- Hazardous Fuels Reduction or habitat improvement activities include: 1999 McDonald Mesa Rollerchop and seeding 300 acres, 2001 and 2003 Wolf Park Thinning 100 acres and 60 acres, Paonia Fuels Reduction 244 acres, and the Lambourn/McDonald loop and scatter 180 acres.

**Reasonably Foreseeable Future 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 future actions:

- Oxbow Mining, LLC (Elk Creek Mine) was granted a 786-acre lease by application with

surface disturbance of approximately 5.63 acres on public lands and a 157-acre coal lease modification with no surface disturbance on the GMUG.

- Oxbow has also submitted a lease modification of the East Elk Creek lease (COC-70615), requesting to add approximately 364 acres of NFS lands to their existing lease.
- Mountain Coal Company (West Elk Mine) applied to construct, operate, and reclaim up to 159 E Seam MDW 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. On August 2, 2012, the GMUG issued a Record of Decision on its FEIS and consented to BLM to issue two lease modifications adjacent to each other and to current leases to the south within the GMUG. It would add approximately 1,700 acres to the West Elk Mine, of which an estimated 73 acres would be actively disturbed for the remaining life of the mine. The GMUG and BLM are currently evaluating an exploration plan on these lease modifications.
- Oxbow Mining, LLC (Oak Mesa Project – coal exploration license) submitted 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 32.9 acres.
- Bowie (Bowie No. 2 Mine) was granted two lease modifications adjacent to current leases to the north under private and public lands. They add approximately 502 acres, and temporary surface disturbances from road and pad construction would occur on about 16.6 acres.
- Bowie (Bowie No. 2 Mine) applied for a lease by application adjacent to current leases to the north under private, national forest and public lands and are in the first stages of NEPA analysis (i.e., the Proposed Action, herein).

Additional actions including coal lease modifications and new coal lease applications could be expected in the North Fork Valley. These factors may affect how longwall 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 19 total permits.

- 6 shale well permits;
- 8 coal-bed methane wells; and
- 5 coal mine methane wells.
- Total estimated disturbance based on current permits – approximately 130 acres (based on 6.8 acres of disturbance per well).

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 conventional Mancos Shale wells and wells used to capture methane from coal mines. It is estimated that the area will average 10 new pads per year (average 3 acres of disturbance per pad). This will then create approximately 30 acres of new disturbance per year from oil and gas development.

In addition, the USFS is currently reviewing a proposal for Petrox LLC, involving up to 50 gas wells on 24 drilling locations within the Somerset Unit. The Master Development Plan has not yet been released for scoping.

The USFS recently approved the Surface Use Plan for one multiple-well drill pad on the Paonia Ranger District, however the decision has been appealed and is currently under review.

The USFS is in the roadless consultation process for two SG Interests (SG)APDs on the Paonia Ranger District, one adjacent to the Somerset Unit, the other within the Huntsman Unit. The project has not yet been released for scoping.

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 percent of the wells are targeting coalbed methane production and the other 50 percent will be exploring other potentially productive natural gas zones encountered by drilling into other geologic zones in the area of the Bull Mountain Unit.

The BLM and the USFS have received an APD for a gas well on private lands (federal minerals), with access on NFS lands. This project proposal is still in development has not yet proceeded with scoping.

**Cumulative Impacts Summary.** Cumulatively, impacts from the proposed coal LBA 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 significant as analyzed in the specific resource sections above. Impacts resulting from the proposed lease 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, impacts to air quality and vegetation loss or conversion. Cumulative impacts associated with coal mining activities in the area were analyzed in greater detail in the Uncompahgre Basin RMP EIS (BLM, 1988), as well as in the North Fork Coal EIS (USFS and BLM, 2000).

## **PERSONS / AGENCIES CONSULTED**

The following agencies were contacted for input in the development of this EA. Issues raised during scoping are addressed in more detail in the Scoping and Identified Issues section.

- U.S. Fish and Wildlife Service, Grand Junction, Colorado
- Office of Surface Mining
- Western Area Power Administration
- Colorado Division of Reclamation and Mine Safety
- Colorado Parks and Wildlife
- Delta County Planning Department

## INTERDISCIPLINARY REVIEW

The following BLM and USFS personnel have contributed to and have reviewed this EA:

<b>Name</b>	<b>Title</b>	<b>Area of Responsibility</b>
<b>BLM</b>		
Amanda Clements	Ecologist	Wetland and Riparian
Desty Dyer	Mining Engineer	Solid Mineral Leasing
David Epstein	Socioeconomics Specialist	Socioeconomics
Glade Hadden	Archaeologist	Cultural Resources, Paleontology
Edd Franz	Recreation Specialist	Wild and Scenic Rivers
Ken Holsinger	Forest management, wildlife	Forestry, Migratory Birds, Threatened, Endangered and Sensitive Species, Terrestrial and Aquatic Wildlife
Kelly Homstad	Fire Use Specialist	Wildfire, Air Quality/Climate
Julie Jackson	Outdoor Recreation Planner	VRM, Recreation, Wilderness, Transportation
Dave Kauffman	Biological Staff Supervisor	Biological Resources
Alan Kraus	Hazmat Specialist	Solid and Hazardous Wastes
Bruce Krickbaum	NEPA Coordinator	EA/NEPA Review and Compliance
Chad Meister	Air Quality Specialist	Air Quality, Climate
Teresa Pfifer	Land and Minerals Supervisor	Lands and Minerals
Linda Reed	Realty Specialist	Realty Authorizations
Lynae Rogers	Range Specialist	Invasive Species, Range, Vegetation
Jedd Sondergard	Hydrologist	Soil, Water
Thane Stranathan	Natural Resources Specialist	Oil and Gas, GIS data
<b>Forest Service</b>		
Matt Dare	Fisheries Biologist	Fisheries
Dennis Garrison	Wildlife Biologist	Terrestrial Biology
Dan Gray	Natural Resource Specialist	Natural resources
Kevin Kyle	Timber Specialist	Forestry
Liz Lane	Zone Archaeologist	Cultural Resources
Niccole Mortenson	NEPA Specialist	Document review, USFS internet
Gary Shellhorn	Hydrologist/Air Quality reviewer	Hydrology
Mike Surber	Range Specialist	Range resources
Ryan Taylor	NEPA IDT Leader and primary project contact for the USFS	NEPA IDT Leader and primary project contact for the USFS, Soils, Geology

## LIST OF ACRONYMS AND ABBREVIATIONS

ACECs	Areas of Critical Environmental Concern
AO	Authorized Officer
APCD	Air Pollution Control Division
AQRVs	Air Quality Related Values
AUMs	animal unit months
BA	Biological Assessment
BCC	Birds of Conservation Concern
BCR	bird conservation regions
BE	Biological Evaluation
BLM	Bureau of Land Management
BMPs	Best Management Practices
Bowie	Bowie Resources, LLC
BTU	British Thermal Unit
CAA	Clean Air Act
CAAQS	Colorado Ambient Air Quality Standards
CAFÉ	corporate average fuel efficiency
CDLE	Colorado Department of Local Affairs
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
CHIA	cumulative hydrologic impacts analysis
CH <sub>4</sub>	methane
CMM	Coal Mine Methane
CNHP	Colorado Natural Heritage Program
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CO <sub>2e</sub>	carbon dioxide equivalent
COGCC	Colorado Oil and Gas Conservation Commission
CPW	Colorado Parks and Wildlife
CR	Colorado River
DAU	data analysis unit
DOE	Department of Energy
DPS	Distinct Population Segment
DRMS	Division of Reclamation Mining and Safety
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FCLAA	Federal Coal Leasing Amendments Act
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act
FR	Forest Service roads
FSH	Forest Service Handbook
GBCT	Greenback Cutthroat Trout
GHGs	greenhouse gases
GMU	Game Management Unit
GMUG	Grand Mesa, Uncompahgre, and Gunnison National Forests

GMNF	Grand Mesa National Forest
GVG	gob vent gas
GWP	global warming potential
HAP	hazardous air pollutants
HCFC	hydrochlorofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
LAU	lynx analysis unit
LBA	lease-by-application
LDGT	light duty gasoline truck
LHA	Land Health Assessment
LiDAR	Light Detection and Ranging
LRMP	Land and Resource Management Plan
MBTA	Migratory Bird Treaty Act
MDWs	methane drainage wells
MEC	Miller Ecological Consultants, LLC
Mg/L	milligrams per liter
MLA	Mineral Leasing Act
MIS	management indicator species
MOU	Memorandum of Understanding
MSDS	Material Safety Data Sheets
MSHA	Mine Safety and Health Administration
MU	mapping unit
MY	model year
N <sub>2</sub> O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NDIS	National Diversity Information Source
NEPA	National Environmental Policy Act
NF	North Fork Valley
NFS	National Forest System
NO <sub>2</sub>	nitrogen dioxide
NO <sub>x</sub>	nitrogen oxides
NRCS	Natural Resource Conservation Service
NSPS	New Source Performance Standard
NWI	National Wetland Inventory
NWSRS	National Wild and Scenic River System
O <sub>3</sub>	ozone
OC	organic carbon
OHV	off-highway vehicle
ORV	outstandingly remarkable value
OSM	Office of Surface Mining Reclamation and Enforcement
Pb	lead
PBA	Programmatic Biological Assessment
PBO	Programmatic Biological Opinion
PFYC	potential fossil yield classification
PM <sub>2.5</sub>	particulate matter less than 2.5 microns in effective diameter
PM <sub>10</sub>	particulate matter less than 10 microns in effective diameter
PSD	Prevention of Significant Deterioration
RFMP	reasonably foreseeable mine plan
RG	Rio Grande
RMP	Resource Management Plan
SCC	source classification code
SIL	significant impact levels

SIP	State Implementation Plan
SMCRA	Surface Mining Control and Reclamation Act
SO <sub>2</sub>	sulfur dioxide
SPM	special-purpose monitoring
TDS	total dissolved solids
TE	thermal efficiency
TSP	total suspended particulate
TSS	total suspended solids
UFO	Uncompahgre Field Office
USDI	U.S. Department of the Interior
USGS	U.S. Geological Survey
USFS	U.S. Department of Agriculture Forest Service
USFWS	U.S. Fish and Wildlife Service
VAM	Ventilation Air Methane
VCG	Vessels Coal Gas, Inc.
VMT	vehicle miles travelled
VOCs	volatile organic compounds
VRM	visual resource management
VQOs	visual quality objectives
WAPA	Western Area Power Administration
WQCC	Water Quality Control Commission
WSR	Wild and Scenic River
WSRA	Wild and Scenic Rivers Act
WWE	Wright Water Engineers, Inc.

## REFERENCES

- Adams, R.A. 2003. Bats of the Rocky Mountain West. University of Colorado Press, Boulder, Colorado.
- Andrews, R. and R. Righter. 1992. Colorado Birds: a Reference to their Distribution and Habitat. Denver Museum of Natural History. Denver, Colorado.
- Beason, J.P. 2009. Yellow-billed Cuckoos in Western Colorado. Tech Rep. R-YBCUCPW & USFWS-08-1. Rocky Mountain Bird Observatory, Brighton, Colorado, 27 pp. Accessed online at :  
[http://rmbo.org/public/monitoring/PDF\\_Reports/CPW\\_USFWS\\_YBCU\\_REPORT\\_26JAN09v3.pdf](http://rmbo.org/public/monitoring/PDF_Reports/CPW_USFWS_YBCU_REPORT_26JAN09v3.pdf).
- Bureau of Land Management. 1988. Uncompahgre Basin Proposed Resource Management Plan and Final Environmental Impact Statement, September 1988. 196 pages.
- Bureau of Land Management. 1989. Uncompahgre Basin Resource Management Plan and Record of Decision (amended, 1992, 1994, 1997, 2001). Uncompahgre Field Office. Montrose, Colorado.
- Bureau of Land Management. 2002. Canada Lynx Habitat Mapping, GIS data. Uncompahgre Field Office, Montrose, Colorado.
- Bureau of Land Management. 2005. Little Snake Resource Management Plan, Analysis of the Management Situation. April 2005.
- Bureau of Land Management. 2007. North Fork Land Health Assessment, 2006-2007. Bureau of Land Management, Uncompahgre Field Office, Montrose, Colorado. 110 pages.
- Bureau of Land Management. 2009. BLM Colorado State Director's Sensitive Species List. Accessed online:  
<http://www.blm.gov/pgdata/etc/medialib/blm/co/programs/botany.Par.8609.File.dat/BLM%20CO%20SD%20Sensitive%20Spec.%20List.pdf>. November.
- Bureau of Land Management. 2010. Final Wild and Scenic River Eligibility Report for the BLM Uncompahgre Planning Area. June 2010.
- Bureau of Land Management. 2011. BLM's Land and Mineral Legacy Rehost 2000 System-LR2000. Accessed online: <http://www.blm.gov/lr2000/>.
- Bureau of Land Management. 2013. BLM's Land and Mineral Legacy Rehost 2000 System-LR2000. Accessed online: <http://www.blm.gov/lr2000/>.
- Carrillo, Michael. 2010. Fish Species in the Terror Creek System. E-mail with WestWater Engineering. March 30, 2010.
- Chronic, H. and F. Williams. 2002. Roadside Geology of Colorado. Second Edition. Mountain Press Publishing Company, Missoula, Montana.
- Climate Analysis Indicators Tool (CAIT-US). 2011. Version 4.0. World Resources Institute, Washington, DC. Accessed online: <http://cait.wri.org/>. March 28, 2011.

- Colorado Department of Agriculture. 2011. Colorado Noxious Weed List. Noxious Weed Management Program. Accessed online: <http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1174084048733>. September.
- Colorado Department of Labor and Employment. 2013. Labor Market Information. Quarterly Census of Employment and Wages. Accessed online: [www.colmigateway.com](http://www.colmigateway.com).
- Colorado Department of Natural Resources. 2011. Colorado Decision Support Systems, Water Rights Database. Colorado Department of Natural Resources, Division of Water Resources, Denver. Available online: <http://cdss.state.co.us/onlineTools/Pages/WaterRights.aspx>.
- Colorado Department of Public Health and Environment. 2008. Colorado Air Quality Control Commission Report to the Public 2007-2008. 60 pages.
- Colorado Department of Public Health and Environment. 2010a. Colorado 2009 Air Quality Data Report. Colorado Department of Public Health and Environment, Air Pollution Control Division, Denver. August 2010.
- Colorado Department of Public Health and Environment. 2010b. State of Colorado Integrated Water Quality Monitoring and Assessment Report Prepared Pursuant to Section 303(d) and Section 305(b) of the Clean Water Act. Colorado Department of Public Health and Environment, Water Quality Control Commission, Denver. Accessed online: [http://www.cdphe.state.co.us/op/wqcc/Resources/waterstatus\\_305\\_b/305bRept2010.pdf](http://www.cdphe.state.co.us/op/wqcc/Resources/waterstatus_305_b/305bRept2010.pdf).
- Colorado Department of Public Health and Environment. 2010c. Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Regulation No. 93, effective April 30, 2010. Colorado Department of Public Health and Environment, Water Quality Control Commission, Denver. Accessed online: <http://www.cdphe.state.co.us/regulations/wqccregs/100293wqlimitedsegmdlsnew.pdf>.
- Colorado Department of Public Health and Environment. 2010d. Integrated Water Quality Monitoring and Assessment Report, 2010 Update to the 2008 305(b) Report. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver.
- Colorado Department of Public Health and Environment. 2011. Letter from Nancy Chick to Ralph Morris, Environ Corporation, Summary of rural area background concentration estimates for the BLM Grand Junction and Uncompahgre Field Office Resource Management Plans. Colorado Department of Public Health and Environment, Air Pollution Control Division, Denver. June 6 2011.
- Colorado Division of Wildlife, Bureau of Land Management, and Forest Service. 2003. Colorado Vegetation Classification Project. Accessed online: <http://ndis.nrel.colostate.edu/coveg/>.
- Colorado Natural Heritage Program. 2012. Rare Plant Guide. Colorado State University. Accessed online: <http://www.cnhp.colostate.edu/>.
- Colorado Parks and Wildlife. 2011. Colorado's Biological Map and Data Resource. Natural Diversity Information Source, Colorado Division of Wildlife. Accessed online: <http://ndis.nrel.colostate.edu/>.
- Colorado Parks and Wildlife. 2012a. Species Profiles. Accessed online: <http://wildlife.state.co.us/WILDLIFESPECIES/PROFILES/Pages/WildlifeProfiles.aspx>.

- Colorado Parks and Wildlife. 2012b. Natural Diversity Information Source. Colorado State University. Accessed online: <http://ndis.nrel.colostate.edu/>.
- Colorado Parks and Wildlife. 2012c. Colorado Hunting Atlas. Accessed online: <http://ndis-flex.nrel.colostate.edu/HuntingAtlas/>.
- Colorado Parks and Wildlife. 2013a. Species Profiles. Accessed online: <http://wildlife.state.co.us/WILDLIFESPECIES/PROFILES/Pages/WildlifeProfiles.aspx>.
- Colorado Parks and Wildlife. 2013b. 2011 Elk Harvest Summaries. <http://wildlife.state.co.us/SiteCollectionDocuments/DOW/Hunting/BigGame/Statistics/Elk/2011ElkHarvestSurvey.pdf>.
- Colorado Parks and Wildlife. 2013c. Elk 2011 Post-hunt Population Estimates. <http://wildlife.state.co.us/SiteCollectionDocuments/DOW/Hunting/BigGame/Statistics/Elk/2011ElkPopulationEstimate.pdf>.
- Conner, C., B. Davenport, and J. Smith. 2012. Class III Cultural Resources Inventory and Paleontological Assessment of the Proposed Spruce Stomp Lease Modification Area (1850 Acres) in Delta County, Colorado, for Bowie Resources, LLC. GMUG NF Report No. R2012-020408-123. Submitted to the Paonia Ranger District of the GMUG National Forest and Uncompahgre Field Office of the BLM. Manuscript on File, Grand Mesa, Uncompahgre, and Gunnison (GMUG), National Forests Supervisor's Office, Delta, Colorado.
- Culver, D.R., P. Lyon, and J. Huggins. 2008. Survey of Critical Biological Resources, Rio Blanco County, Colorado. Prepared for Rio Blanco County, Meeker, CO, U.S. Environmental Protection Agency, Region 8, Denver CO, and Colorado Department of Natural Resources, Division Wildlife, Wetlands Program, Denver, Colorado.
- Dare, M., M. Carrillo, and C. Speas. 2011. Cutthroat trout (*Oncorhynchus clarkii*) Species and Conservation Assessment for the Grand Mesa, Uncompahgre, and Gunnison National Forests. Grand Mesa, Uncompahgre, and Gunnison National Forests, Delta, Colorado.
- Dare, M. 2013. [Grand Mesa, Uncompahgre, and Gunnison National Forests. Personal Communication. August, 2013.](#)
- Delta County. 2012. Assessor's Office. Summary of Assessments and Levies – 2012. Accessed online: [www.deltacounty.com/DocumentCenter/View/7445](http://www.deltacounty.com/DocumentCenter/View/7445).
- Dunrud, C.R. 1976. Some engineering geologic factors controlling coal mine subsidence in Utah and Colorado: U.S. Geological Survey Professional Paper 969, 39p.
- Dunrud, C.R. 1989. Geologic Map and Coal Stratigraphic Framework of the Paonia area, Delta and Gunnison Counties, Colorado: U.S. Geological Survey Coal Investigations Maps C-115 and C-116.
- Etter, A. 2012. Project Engineer – Bowie Resources, LLC. Personal Email Communication with Jim Ferguson. WestWater Engineering. January 10, 2012.
- Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado. Niwot, Colorado.

- Federal Emergency Management Agency. 1989. Flood Insurance Rate Map, Gunnison County, Colorado (Unincorporated Areas). Community Panel Numbers 080078 275 B, 080078 125 B, and 080078 235 B. September 29, 2008.
- Forest Service. 2005. Merriam's Turkey (*Meleagris gallapovo merriami*) Species Assessment. Grand Mesa, Uncompahgre, and Gunnison National Forests. Delta, Colorado.
- Forest Service. 2011. Environmental Assessment for Federal Coal Lease Modification COC-61357. Paonia Ranger District (Grand Mesa, Uncompahgre, and Gunnison National Forests). August 2011.
- Forest Service. 2013a. Vegetation from shapefile received from USFS entitled: Terror\_Creek\_HUC6\_veg\_022613\_V1.
- Forest Service. 2013b. Biological Evaluation and Management Indicator Species Assessment for Spruce Stomp Lease by Application. Paonia Ranger District, Grand Mesa, Uncompahgre, Gunnison National Forest Delta County, Colorado. March, 2013.
- Forest Service and Bureau of Land Management. 2000. Final Environmental Impact Statement, Iron Point Exploration License, Iron Point Coal Lease Tract, Elk Creek Coal Lease Tract, Delta and Gunnison Counties, Colorado, February 2000. (North Fork Coal EIS).
- Hammerson, G.A. 1986. Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Denver, Colorado.
- Intergovernmental Panel on Climate Change (IPCC). 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 – Energy. Table 2.2 Default Emission Factors for Stationary Combustion in the Energy Industries. ISBN 4-88788-032-4. Accessed on March 28, 2011 from <<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>>.
- Junge, WR. 1978. Surficial Geology of the Bowie Quadrangle. Colorado Geological Survey. Plate 2 of 7. Surficial geology, Hotchkiss-Paonia Reservoir area, Delta and Gunnison Counties, Colorado, Denver.
- Kingery, Hugh E., ed. 1998. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver. 636 pages.
- Knick, S.T., and J.T. Rotenberry. 2001. Effects of Habitat Fragmentation on Passerine Birds Breeding in Intermountain Shrubsteppe. *Studies in Avian Biology* No. 25:130-140.
- Kowalski, D. 2010. Greenback Cutthroat Trout in Terror Creek. Personal Communication with WestWater Engineering, December 9, 2010.
- Lane, E. 2013. Assessment of Effects of Subsidence to Historic Properties within the Proposed Spruce Stomp Lease Modification Area. GMUG NF Report No. R2012-020408-123A. Manuscript on File, Grand Mesa, Uncompahgre, and Gunnison (GMUG) National Forests Supervisor's Office, Delta, Colorado.
- Lucas, S.G. 1998. Fossil Mammals and the Paleocene/Eocene Series Boundary in Europe, North America, and Asia. *In* Late Paleocene-Early Eocene Climatic and Biotic Events in the Marine and Terrestrial Records, Marie-Pierre Aubry, M-P., Lucas, S.G., and Berggren, W.A., (eds.). Columbia University Press, New York.

- Mine Safety and Health Administration. 2013. Mine Data Retrieval System. Accessed at [www.msha.gov/drs/drshome.htm](http://www.msha.gov/drs/drshome.htm).
- National Wetlands Inventory. 2013. Shapefile. Accessed online: <http://www.fws.gov/wetlands/Data/State-Downloads.html>.
- Natural Diversity Information Source. 2011. Colorado's Biological Map and Data Resource. Colorado Division of Wildlife. Accessed online: <http://ndis.nrel.colostate.edu/>.
- Natural Resources Conservation Service. 2013a. Soil Data Mart. Prime and Other Important Farmlands report. CO679 Paonia Area, Colorado, Parts of Delta, Gunnison, and Montrose Counties, Delta County, Colorado. Accessed online: <http://soildatamart.nrcs.usda.gov/>. March.
- Natural Resources Conservation Service. 2013b. Soil Data Mart. Mapping Unit reports generated for CO679 Paonia Area, Colorado, Parts of Delta, Gunnison, and Montrose Counties, Delta County, Colorado. Accessed online: <http://soildatamart.nrcs.usda.gov/>. March.
- Natural Resources Conservation Service. 2013c. Soil Data Mart. Mapping unit reports for CO660 Grand Mesa – West Elk Area, Colorado, Parts of Delta, Garfield, Gunnison, Mesa, and Montrose Counties. Accessed online: <http://soildatamart.nrcs.usda.gov/>. March.
- North Fork Valley Network. 2013. Northfork Valley of Colorful Colorado website. Accessed online: [www.northforkvalley.net](http://www.northforkvalley.net).
- Righter, R., R. Levad, C. Dexter, and K. Potter. 2004. Birds of Western Colorado Plateau and Mesa County. Grand Valley Audubon Society, Grand Junction, Colorado.
- Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2011. The North American Breeding Bird Survey, Results and Analysis 1966 - 2010. Version 12.07.2011 USGS Patuxent Wildlife Research Center, Laurel, MD. Accessed February 7, 2013.
- Speas, C. 2010. Programmatic Water Depletion Biological Opinion for Grand Mesa, Uncompahgre Gunnison National Forest. E-mail communication, March 29.
- Speas, C. 2011. Personal Communication with Jim Ferguson, WestWater Engineering regarding lynx buffer zones, and stream flows in the East Fork of Terror Creek. November 21, 2011.
- Stewart, C, G. Hunt and C. Mark. 2006. Geology, Ground Control and Mine Planning at Bowie Resources, Paonia, Colorado. 25<sup>th</sup> International Conference on Ground Control in Mining, July 2006, Morgantown, West Virginia.
- Tweto, O. 1979. USGS geologic map of Colorado. 1:500,000 scale. Accessed online: <http://geology.about.com/library/bl/maps/blcoloradomap.htm>.
- U.S. Bureau of Labor Statistics. 2013. Local Area Unemployment Statistics. Accessed online: [www.bls.gov/data/](http://www.bls.gov/data/).
- U.S. Census Bureau. 2001. 2000 Census. Accessed online: [www.census.gov](http://www.census.gov).
- U.S. Census Bureau. 2011. 2010 Census. Accessed online: [www.census.gov](http://www.census.gov).

- U.S. Census Bureau. 2012. 2007 – 2011 American Community Survey 5-Year Estimates. Accessed online: [www.census.gov](http://www.census.gov).
- U.S. Census Bureau. 2013. State and County QuickFacts. Accessed online: [www.census.gov](http://www.census.gov).
- U.S. Department of Energy and Bureau of Land Management. 2008. Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States (DOE/EIS-0386). Appendix N: Potential Fossil Yield Classifications (PFYC) for Geologic Formations Intersecting Proposed Corridors under the Proposed Action by State. November 2008.
- U.S. Energy Information Administration. 2009. Annual Energy Review 2009. Table 7.3 Coal Consumption by Sector, Selected Years, 1949-2009. DOE/EIA-0384(2009). August 2009. Accessed online: <http://www.eia.doe.gov/aer/>. March 28, 2011.
- U.S. Fish and Wildlife Service. 1973. Endangered Species Act of 1973. 16 U.S.C. 1544. U.S. Fish and Wildlife Service, Washington, D.C.
- U.S. Fish and Wildlife Service. 1977. Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for Greenback Cutthroat Trout (50 CFR 17). U.S. Department of the Interior, U.S. Fish and Wildlife Service, Federal Register, Vol. 42. No. 168. September 26, 1977. 48901- 48902. Accessed online: [http://ecos.fws.gov/docs/federal\\_register/fr162.pdf](http://ecos.fws.gov/docs/federal_register/fr162.pdf). December 4, 2010.
- U.S. Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Colorado River Endangered Fishes: Razorback Sucker, Colorado Squawfish, Humpback Chub, and Bonytail Chub. Federal Register 59(54): 13374–13400.
- U.S. Fish and Wildlife Service. 1998. Greenback cutthroat trout recovery plan. U.S. Fish and Wildlife Service, Denver, Colorado. Accessed online: [http://ecos.fws.gov/docs/recovery\\_plan/980301.pdf](http://ecos.fws.gov/docs/recovery_plan/980301.pdf). December 3, 2010.
- U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. Division of Migratory Bird Management, Arlington, Virginia. 87 pages. Accessed online: <http://www.fws.gov/migratorybirds/reports/BCC2008/BCC2008m.pdf>.
- U.S. Fish and Wildlife Service. 2009a. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx.
- U.S. Fish and Wildlife Service. 2009b. Consultation Guidance for DeMinimis Water Depletions in the Upper Colorado River Basin. U.S. Fish and Wildlife Service. Ecological Services. Lakewood, Colorado.
- U.S. Fish and Wildlife Service. 2010. Kurt Broderdorp, U.S. Fish and Wildlife Service, personal communication with Jim Ferguson, WestWater Engineering, Grand Junction, Colorado, regarding lynx habitat use on Grand Mesa. July 7, 2010.
- U.S. Fish and Wildlife Service. 2012. Updated FWS Position Paper on ESA Consultations on Greenback Cutthroat Trout, Including the Cutthroat Referred to as Lineage GB. USFWS, October 4, 2012.

- U.S. Fish and Wildlife Service. 2013a. Current Delta County species list. Accessed online: [http://ecos.fws.gov/tess\\_public/countySearch!speciesByCountyReport.action?fips=08029](http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=08029).
- U.S. Fish and Wildlife Service. 2013b. Endangered and Threatened Wildlife and Plants: Threatened Status for the Distinct Population Segment of the North American Wolverine Occurring in the Contiguous United States. Federal Register/Vol. 78, No. 23, February 4, 2013. Pages 7864-7890.
- U.S. Fish and Wildlife Service. 2013c. Endangered and Threatened Wildlife and Plants: Establishment of a Nonessential Experimental Population of the North American Wolverine in Colorado, Wyoming, and New Mexico. Federal Register/Vol. 78, No. 23, February 4, 2013. Pages 7890-7905.
- U.S. Global Change Research Program. 2009. Reports and Assessments, USGCRP Scientific Assessments, Key Findings. Accessed online: <http://globalchange.gov/publications/reports/scientific-assessments/us-impacts/key-findings>. June 22, 2009.
- Vessels Coal Gas, Inc. (VCG). 2012. Methane Recovery Evaluation – Bowie Resources, LLC- Bowie No. 2 Mine. November 21, 2012.
- Weber, W.A., and R.C. Wittmann. 1987. Colorado Flora, Western Slope. University Press of Colorado. Niwot, Colorado.
- Western Regional Climate Center, 2012. General Climate Summary Data for Paonia, Colorado. Accessed online: <http://www.wrcc.dri.edu>.
- WestWater Engineering. 2011. Biological Assessment, Bowie Resources, LLC, Underground Coal Mining Associated Surface Activities and Facilities. Prepared for: Bureau of Land Management Uncompahgre Field Office. November 2011.
- Williams, C.A. and K.J. Leib. 2005. Using Tracers to Evaluate Streamflow Gain-Loss Characteristics of Terror Creek, in the Vicinity of a Mine-Permit Area, Delta County, Colorado, Water Year 2003. Scientific Investigations Report 2005-5018.
- Woodling, J. 1985. Colorado's Little Fish – A Guide to the Minnows and Other Lesser Known Fishes in the State of Colorado. Colorado Division of Wildlife. Denver, Colorado.
- Wright Water Engineers, Inc. 2013a. Evaluation of Potential Subsidence Impacts of Longwall Mining in the Spruce Stomp Lease Area to Aquatic Life and Water Supply. Prepared for Bowie Resources, LLC. January 2013.
- Wright Water Engineers, Inc. 2013b. Biological Assessment for Longwall Coal Mining. Spruce Stomp Lease Area. May 2013.
- Young, M. K. 2009. Greenback Cutthroat Trout (*Oncorhynchus clarkii stomias*): a technical conservation assessment. U.S. Department of Agriculture, U.S. Forest Service, Rocky Mountain Region. Accessed online: <http://www.fs.fed.us/r2/projects/scp/assessments/greenbackcutthroattrout.pdf>. December 30, 2010.