UNITED STATES DEPARTMENT OF THE INTERIOR
OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT

Colowyo Coal Mine
South Taylor/Lower Wilson Permit Expansion Area Project
Federal Mining Plan Modification

Environmental Assessment

Moffat and Rio Blanco Counties, Colorado

August 2015

Prepared in cooperation with the
Bureau of Land Management,
State of Colorado's Department of Natural Resources,
and Moffat County

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Abbreviations and Acronyms

AADT	average annual daily traffic
ACHP	Advisory Council on Historic Preservation
AERMAP	AERMOD Mapping Program
AERMET	AERMOD Meteorological Preprocessor
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
af/yr	acre-feet per year
amsl	above mean sea level
ANFO	ammonium nitrate fuel oil
APCD	Air Pollution Control Division
APE	Area of Potential Effect
APEN	Air Pollution Emission Notice
APLIC	Avian Power Line Interaction Committee
AQCR	Air Quality Control Region
AQRV	Air Quality Related Values
ASLM	Assistant Secretary, Land and Minerals Management
AUM	animal unit month
AVF	alluvial valley floor
BART	Best Available Retrofit Technology
BCC	Birds of Conservation Concern
bcy	bank cubic yards
bhp	brake horsepower
BLM	Bureau of Land Management

BMP	Best Management Practices
CAA	Clean Air Act
CARMMS	Colorado Air Resources Management Modeling Study
CCIA	Colorado Commission of Indian Affairs
CCRs	Coal combustion residuals
CDPHE	Colorado Department of Public Health and Environment
CDRMS	Colorado Division of Reclamation Mining and Safety
CEQ	Council on Environmental Quality
cfs	cubic feet per second
CFR	Code of Federal Regulations
CH_4	methane
CIAA	cumulative impact analysis area
CNHP	Colorado Natural Heritage Programs
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COA	Conditions of Approval
Colowyo	Colowyo Coal Company
CPW	Colorado Parks and Wildlife
cv	coefficient variation
CWA	Clean Water Act
cy	cubic yards
DAU	Data Analysis Unit
dB	decibel

dBA	decibel-A weighted
DM	Departmental Manual
DNR	Department of Natural Resources
DOI	Department of Interior
DOT	Department of Transportation
DPF	diesel particulate filter
DQO	data quality objectives
dv	deciview
EA	Environmental Assessment
EER	Exceptional Events Rule
EGU	electric generating unit
EIS	Environmental Impact Statement
ERMA	extensive recreation management area
ERPI	Electric Research Policy Institute
ESA	Endangered Species Act
FCLAA	Federal Coal Leasing Amendments Act
FEL	front end loader
FEM	federal equivalent method
FHA	Federal Housing Administration
FLPMA	Federal Land Policy and Management Act
FNCA	Federal Noise Control Act
FONSI	Finding of No Significant Impact
FRAN	upper limit on the meander factor
FRM	federal reference method

FWPCA	Federal Water Pollution Control Act
GHG	greenhouse gase
GHGRP	Greenhouse Gas Reporting Program
GHMA	general habitat management area
gpm	gallons per minute
GSG	greater sage-grouse
GSGWG	Greater Sage-Grouse Working Group
GWP	global warming potential
GRP	gross regional product
HAP	Hazardous Air Pollutant
IMPROVE	Interagency Monitoring of Protected Visual Environments
IPPC	Intergovernmental Panel on Climate Change
kV	kilovolt
Leq	equivalent sound level
LOWWIND2	low wind speed option 2
LSFO	Little Snake Field Office
LSRMP	Little Snake Resource Management Plan
MATS	Mercury and Air Toxics Standards
MBTA	Migratory Bird Act
MDN	mercury deposition network
MFP	Management Framework Plans
MLA	Mineral Leasing Act
MMPA	Mining and Minerals Policy Act
mmt	million metric tons

MPDD	mining plan decision document
MSHA	Mine Safety and Health Act
mt	metric ton
mtpy	million tons per year
m/s	meters per second
NAAQS	National Ambient Air Quality Standards
NAD83	North American Datum 1983
NAGPRA	Native American Graves Protection and Repatriation Act
NCDC	National Climate Data Center
NED	National Elevation Dataset
NEI	National Emission Inventory
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_3-	nitrate
N_2O	nitrous oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
O_3	ozone
OHV	off-highway vehicle

OSAC	Office of the State Archaeologist at History Colorado
OSHA	Occupational Safety and Health Administration
OSMRE	Office of Surface Mining Reclamation and Enforcement
PAH	polycyclic aromatic hydrocarbon
PAP	Permit Application Package
PBO	programmatic biological opinion
PCE	primary constituent element
PEL	permissible exposure limit
PFYC	Potential Fossil Yield Classification
PHMA	preliminary habitat management area
$PM_{2.5}$	particulate matter 2.5 microns
PM_{10}	particulate matter 10 microns
ppb	parts per billion
ppm	parts per million
PR02	Permit Revision 02
PSD	Prevention of Significant Deterioration
QAPP	Quality Assurance Project Plan
R2P2	Resource Recovery and Protection Plan
RCRA	Resource Conservation and Recovery Act
RFD	reasonably foreseeable development
RIPRAP	Recovery Implementation Program Recovery Action Plan
RMP	Resource Management Plan
ROD	Record of Decision
SCC	social cost of carbon

SCR	Selective Catalytic Reduction
SDWA	Safe Drinking Water Act
SEM	Scanning Electron Microscopy
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SLB	State Land Board
SMCRA	Surface Mining Control and Reclamation Act
SNCR	Selective Non-Catalytic Reduction
SO_2	sulfur dioxide
SO_4^{2}-	sulfate
SPCC	spill prevention, control, and countermeasures
SRMA	special recreation management area
T&E	threatened and endangered
TDS	total dissolved solids
tpy	tons per year
TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act
TSS	Total suspended solids
TWA_8	8 hour time-weighted average
µg/g	microgram per gram
µg/l	microgram per liter
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service

USGS	U.S. Geological Survey
VER	valid existing rights
VMT	vehicle miles travel
VOC	volatile organic compound
VRI	visual resource inventory
VRM	Visual Resource Management
WOTUS	Waters of the U.S.

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CHAPTER 1 PURPOSE AND NEED

1.1 INTRODUCTION

This Environmental Assessment (EA) has been prepared by the Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region Office, with assistance from the following cooperating agencies: the Bureau of Land Management (BLM), Little Snake Field Office (LSFO); the State of Colorado, Department of Natural Resources (DNR) (including the Executive Director's Office, Colorado Division of Reclamation Mining and Safety (CDRMS), Colorado Division of Parks and Wildlife (CPW), and Colorado State Land Board (SLB)); and Moffat County. Because of a recent court decision issued on May 8, 2015, *WildEarth Guardians v. U.S. Office of Surface Mining et al.*, Case 1:13-cv-00518-RBJ (D. Colo. 2015), which is requiring subsequent analysis, this EA reevaluates the environmental impacts resulting from a mining plan modification for the South Taylor/Lower Wilson Permit Expansion Area (the Project). The Project was originally proposed by the Colowyo Coal Company, L.P. (Colowyo) in 2006, and approved by the U.S. Department of the Interior (DOI) Assistant Secretary, Land and Minerals Management (ASLM) in 2007, pursuant to the requirements of the Mineral Leasing Act of 1920, as amended (MLA), and the implementing regulations. The Colowyo Coal Mine is located approximately 26 miles (42 kilometers [km]) southwest of Craig, Colorado and 22 miles (35 km) north-northeast of Meeker, Colorado, west of Colorado Highway 13 in southeast Moffat and northern Rio Blanco Counties, Colorado (**Figure 1-1**).

The National Environmental Policy Act of 1969 (NEPA) requires Federal agencies to disclose to the public the potential environmental impacts of projects they authorize and to make a determination as to whether the analyzed actions would "significantly" impact the environment. "Significantly" is defined by NEPA and is found in Title 40 Code of Federal Regulations (CFR) 1508.27. If OSMRE determines that this Project would have significant impacts following the analysis in the EA, then an Environmental Impact Statement (EIS) would be prepared for the Project. If OSMRE determines that the potential impacts would not be "significant," OSMRE will prepare a "Finding of No Significant Impact" (FONSI) statement to document this finding, and accordingly would not prepare an EIS.

On July 3, 2006, Colowyo proposed to extend existing mining operations on Federal leases COC 29225 and COC 29226 (under previous permit revisions and mining plan modification approvals) into the remainder of those Federal coal leases. The Project also included extending the mining operation into undeveloped Federal coal lease COC 012347601, along with additional private lands, within the Lower Wilson Area. *At that time*, Colowyo *did not* propose to mine in the Lower Wilson area but *noted that* this area may be proposed for mining in the future. OSMRE prepared a supplemental EA for the Project and, based on that EA, reached a FONSI on May 8, 2007.

CDRMS approved a Mine Permit Revision 02 (PR02), which became final on June 8, 2007 in accordance with its responsibilities under the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The DOI ASLM, in accordance with the MLA, approved Colowyo's mining plan modification for the Project on June 15, 2007, based on a recommendation from OSMRE for approval of the Project. In 2008, Colowyo commenced mining in the Project Area in accordance with its state mine permit and Federal mining plan modification approvals. To date, mining and reclamation operations under PR02 have been ongoing in the approved permit area.

This EA has been prepared in accordance with the following: NEPA and the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR 1500-1508); the DOI's regulations for implementation of NEPA (43 CFR Part 46); the DOI's Departmental Manual (DM) Part 516; and OSMRE's Directive REG-1, Handbook on Procedures for Implementing the National Environmental Policy Act of 1969 (OSMRE 1989). Information gathered from *the public*; Federal, state, and local agencies; Colowyo; and publicly available literature, as well as in-house OSMRE sources such as Colowyo's Permit Application Package (PAP), were used in the preparation of this EA.

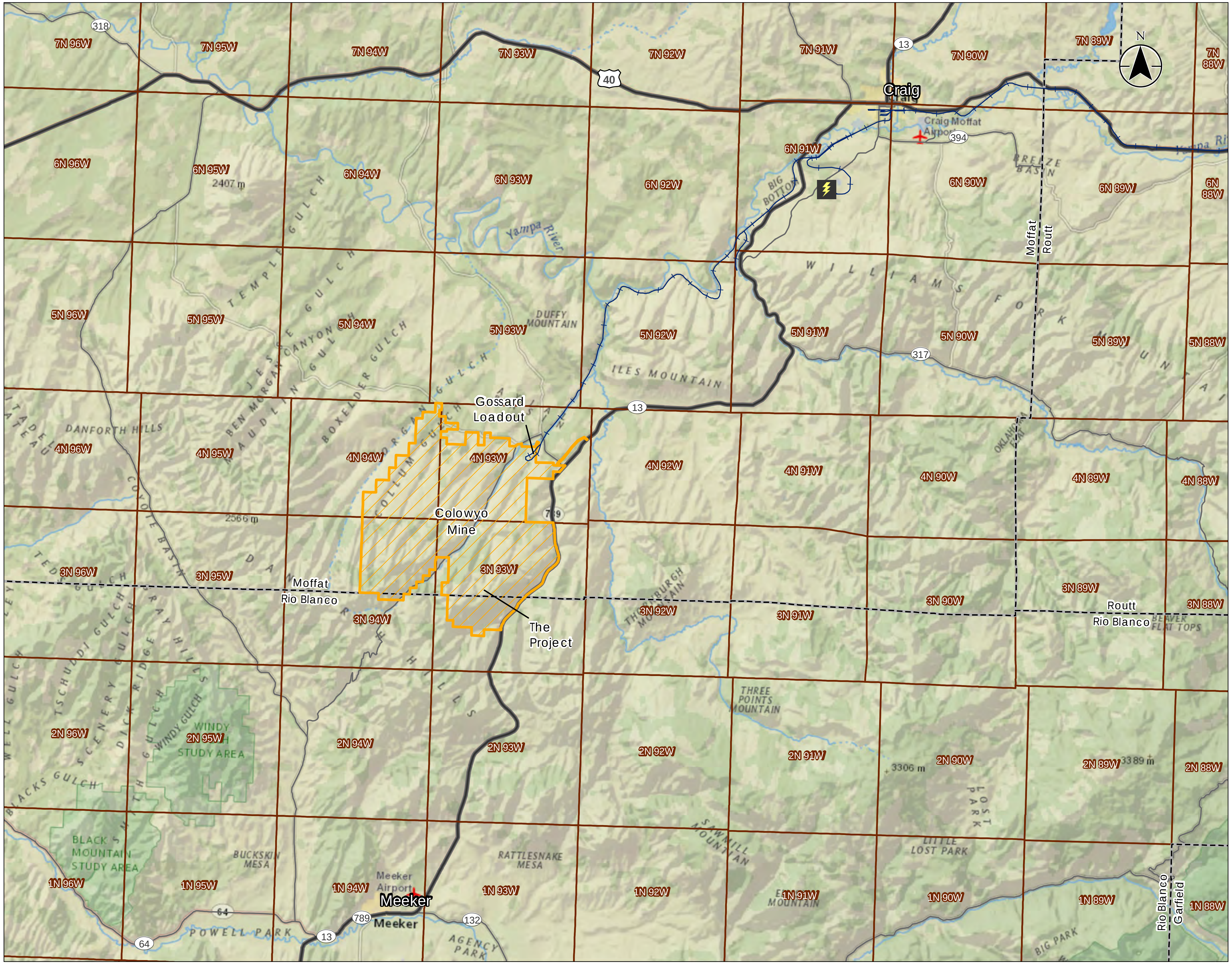
1.2 BACKGROUND

Coal has been mined on a commercial scale in the Colowyo Coal Mine area for over 100 years. Coal was mined by underground mining techniques continuously until 1974 when the underground mines closed. In 1977, Colowyo initiated its first surface mining operation at the Colowyo Coal Mine, to access thinner coal seams located closer to the surface than the seams historically developed through underground mining.

In 1979, BLM completed the Final EIS for the Federal Coal Management Program and the Secretary of the Interior adopted a new program for the management of coal resources on Federal lands. The potential environmental impacts of leasing Federal coal resources in Colorado and Wyoming were analyzed in the Final Green River - Hams Fork Regional Coal EIS (BLM 1980).

Colowyo subsequently obtained rights to the additional Federal coal leases and a state lease to expand its coal reserve base and ensure continuity of mining. Three Federal leases are included in the Project. Lease COC 012347601 was issued by BLM in December 1966 to Utah International Inc., and assigned to Colowyo in March 1994. In May 1982, BLM issued lease COC 29225 to Utah International, and approved assignment of the lease to Colowyo in March 1994. Lease COC 29226 was issued by BLM in March 1983 to Utah International and also assigned to Colowyo in March 1994.

To plan ahead for the depletion of coal reserves and ensure continued mining operations, Colowyo submitted PR02 to CDRMS in 2006 to revise the PAP and expand the approved boundary of their existing SMCRA permit. The Project included approximately 2,223 acres of Federal surface estate and approximately 5,219 acres of Federal mineral estate in the Federal coal leases that are managed by the BLM. The Project also included approximately 3,827 acres of surface estate privately owned by Colowyo and approximately 831 acres of mineral estate that are privately owned by another entity. No state lands were included in the Project. The revision proposed adding approximately 6,050 acres of the combination of private and Federal, surface lands and subsurface mineral estate described above to the previously approved permit area of 7,531 acres, for a new total of 13,581.15 acres within the expanded permit area.



Approved SMCRA Permit Area

Craig Generating Station

Railroad

Road

Highway

Township Boundary

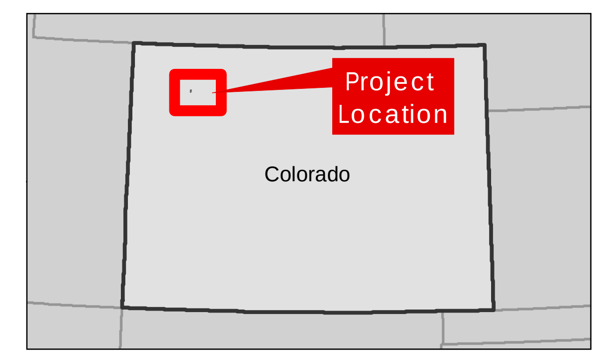
County Boundary

0 4 8 miles

1:253,440 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.



Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.

1-1

Title

Regional Location Map

PR02 and the mining plan modification for the Project, approved by CDRMS and the ASLM respectively in 2007, permitted Colowyo to mine 43 million tons of coal, produce at a rate of up to 6 million tons per year (mtpy) over the period from 2008 to 2017 and disturb a *total of 1,562 acres, including 1,180.7 acres of new surface disturbance, and 381.3 acres of disturbance of lands that had already been disturbed under previous permit approvals*[1]. PR02 also included baseline soils, vegetation, and hydrology information for a possible future Lower Wilson Pit to potentially be developed in the northwestern portion of the Project. Development of the possible future Lower Wilson Pit would include Federal lease COC 012347601. While Colowyo provided baseline information for this area, no mine plan or discussion of any mining operations, including disturbed and affected acreages, were proposed by Colowyo in their PAP for PR02. CDRMS included several stipulations attached to the approved PR02 regarding additional investigations that Colowyo would need to conduct and information submittals they would need to provide for CDRMS to consider for a possible future Lower Wilson Pit. CDRMS also stipulated that no disturbance was approved for the Lower Wilson Area under the approved PR02. Since 2007, Colowyo has not proposed development of the Lower Wilson Pit and has no future plans to initiate that proposal. As a result, no surface disturbance, mining or related operations have or are planned to occur on Federal lease COC 012347601, and it is not included in descriptions below of past, current, or reasonably foreseeable future operations.

Colowyo Coal Company L.P., operator of the Colowyo Coal Mine, is a limited partnership which is indirectly owned by Western Fuels – Colorado. Western Fuels - Colorado is owned by Tri-State Generation & Transmission Association, Inc. The mine produces coal from the South Taylor Pit located on Federal coal leases COC 29225 and COC 29226. Coal has been produced from the South Taylor Pit since 2008. The Section 16 and West pits were also mined at various levels between 2008 and 2013 and 2014, respectively, under previous CDRMS approvals. Colowyo operates the existing Colowyo mine under Coal Mining Permit number C-1981-019 issued by CDRMS in accordance with their Colorado State Coal Regulatory Program (30 CFR Part 906) approved under SMCRA. Currently, the Colowyo Coal Mine produces approximately 2.3 mtpy and provides coal primarily to the Craig Station located in Craig, Colorado, approximately 26 miles (42 km) northeast of the mine. However, the mine has sold coal on the open market to several organizations including, but not limited to, Arizona Electric Power Cooperative, American Electric Power, Celanese, City of Colorado Springs, Coleto Creek, Coors Energy, Entergy, Public Service Company of Colorado, and the Salt River Project. Colowyo actively markets its coal. Once an inquiry is received from an interested buyer, Colowyo sends a small sample of coal so that test burns can be conducted, which may lead to a future contract. Contracts typically range in length from one time only, on the spot sales, to about three years. Once contracts are in place, Colowyo ships coal to customers via an on-site rail spur connected to a Union Pacific main rail line that can accommodate coal shipments to anywhere in the country.

[1] Italicized text denotes language inserted either in response to comments received (see Appendix F) or to clarify or update a topic. If you require additional details regarding the changes applied please contact the OSMRE Field Operations Branch Manager at (303) 293-5035.

1.2.1 Statutory and Regulatory Background

For new mining plans, OSMRE prepares a mining plan decision document (MPDD) in support of its recommendation to the ASLM. For existing approved mining plans that are proposed to be modified, as is the case here, OSMRE prepares a MPDD for a mining plan modification. The ASLM reviews the MPDD and decides whether or not to approve the mining plan modification, and, if approved, what conditions, if any, may be needed. Pursuant to 30 CFR 746.13, OSMRE's recommendation is based, at a minimum, upon:

- The PAP;
- Information prepared in compliance with NEPA, including this EA;
- Documentation assuring compliance with the applicable requirements of Federal laws, regulations and executive orders other than NEPA;[2]
- Comments and recommendations or concurrence of other Federal agencies and the public;
- Findings and recommendations of the BLM with respect to the Resource Recovery and Protection Plan (R2P2), Federal lease requirements, and the MLA;
- Findings and recommendations of CDRMS with respect to the mine permit application and the Colorado State program; and,
- The findings and recommendations of the OSMRE with respect to the additional requirements of 30 CFR Chapter VII, Subchapter D.

1.3 PURPOSE AND NEED

1.3.1 Need

Coal mining operators must have a mining plan approved by the ASLM to mine federal coal. 30 CFR 746.11. OSMRE is the agency responsible for making a recommendation to the ASLM regarding a decision on proposed mining plan modifications. 30 CFR 746.13. Colowyo is presently operating under a surface mining plan modification approved in 2007 that allows it to mine federal coal from the South Taylor/Lower Wilson Expansion Area in accordance with the surface mining permit issued by CDRMS. Under state regulations, surface mining and underground mining are permitted separately and subject to differing requirements (CDRMS 2005). CDRMS has approved the Colowyo Mine only for surface mining (Colowyo 2013).

On May 8, 2015, the *U.S. District Court for the* District of Colorado found various NEPA violations in connection with Interior's 2007 approval of a mining plan modification for the South Taylor/Lower Wilson Expansion Area. *See WildEarth Guardians v. U.S. Office of Surface*

[2] In order to assist with assuring compliance with other Federal laws, regulations and executive orders, OSMRE also reviews, at a minimum, the following documents to make its recommendation to the ASLM: information/correspondence concerning the U.S. Fish and Wildlife Service (USFWS) Section 7 consultation for threatened and endangered (T&E) species potentially affected by the proposed mining plan under the Endangered Species Act of 1973 (ESA) (USFWS 2006 and 2007), and the National Historic Preservation Act of 1966 (NHPA) "Section 106" consultations for the affected area (CHS 2007).

Mining et al., Case 1:13-cv-00518-RBJ (D. Colo. 2015). The court ordered DOI to complete additional NEPA analysis (complete with public participation) within 120 days, indicating that the Secretary's approval of the 2007 mining plan modification for Colowyo would be vacated if DOI does not timely complete the required analysis. As a result, OSMRE has identified a need for it to re-evaluate its previous mining plan modification recommendation for this area based, in part, on the PAP submitted to OSMRE and CDRMS and for the ASLM to issue a new decision whether to approve, disapprove, or approve the mining plan modification with conditions. 30 CFR 746.14.

1.3.2 Purpose

The purpose of this federal action is to re-evaluate the environmental effects of the currently approved coal mining in the South Taylor/Lower Wilson Permit Expansion Area, PR02, to assist OSMRE in developing a new recommendation for the ASLM to make a new decision on the mining plan modification for this area.

1.4 RELATIONSHIP TO STATUTES, REGULATIONS, AND OTHER AGENCY PLANS

1.4.1 Statutes and Regulations

The following key laws, as amended, establish the primary authorities, responsibilities, and requirements for developing Federal coal resources:

- Mineral Leasing Act of 1920 (MLA)
- National Historic Preservation Act of 1966 (NHPA)
- National Environmental Policy Act of 1969 (NEPA)
- Mining and Minerals Policy Act of 1970 (MMPA)
- Clean Air Act of 1970 (CAA)
- Clean Water Act of 1972 (CWA)
- Endangered Species Act of 1973 (ESA)
- Colorado Surface Coal Mining Reclamation Act of 1979
- Federal Land Policy and Management Act of 1976 (FLPMA)
- Federal Coal Leasing Amendments Act of 1976 (FCLAA)
- Surface Mining Control and Reclamation Act of 1977 (SMCRA)

The MLA and FCLAA provide the legal foundation for the leasing and development of Federal coal resources. BLM is the Federal agency delegated the authority to offer Federal coal resources for leasing and to issue leases. The MMPA declares that it is the continuing policy of the Federal government to foster and encourage the orderly and economic development of domestic mineral resources. In that context, BLM complies with FLPMA to plan for multiple uses of public lands and determine those lands suitable and available for coal leasing and development. Through preparation of land use plans and/or in response to coal industry proposals to lease Federal coal, BLM complies with NEPA to disclose to the public the potential impacts from coal leasing and development, and also complies with the NHPA, CAA, CWA, ESA and other environmental laws to ensure appropriate protection of other resources. BLM then makes the lands that are determined suitable for coal development available for leasing. BLM is also responsible for ensuring that the public receives fair market value for the leasing of Federal coal. Once a lease is issued, BLM ensures that the maximum economic recovery of coal is achieved during the mining of those Federal leases and ensures that waste of Federal coal resources is minimized through review and approval of a mine's R2P2 as required under the MLA. BLM implements its responsibilities for leasing and oversight of coal exploration and development under its regulations at CFR, Title 43, Public Lands, Subtitle B, Chapter II, BLM, Department of the Interior, Subchapter C – Minerals Management, Parts 3400 – 3480 (43 CFR Parts 3400-3480).

SMCRA provides the legal framework for the Federal government to regulate coal mining by balancing the need for continued domestic coal production with protection of the environment and ensuring the mined land is returned to beneficial use when mining is finished. OSMRE was created in 1977 under SMCRA to carry out and oversee those Federal responsibilities. OSMRE implements its MLA and SMCRA responsibilities under regulations at CFR Title 30 - Mineral Resources, Chapter VII - Office of Surface Mining Reclamation and Enforcement, Department of the Interior, Subchapters A-T, Parts 700-955.

As provided for under SMCRA, OSMRE works with coal producing states to develop their own regulatory programs to permit coal mining. Once a regulatory program is approved for a state, OSMRE steps into an oversight role. OSMRE has approved CDRMS's coal regulatory program, and as a result, CDRMS manages its own program under the Colorado Surface Coal Mining Reclamation Act of 1979 (30 CFR 906.10). CDRMS has the authority and responsibility to make decisions to approve surface coal mining permits and regulate coal mining in Colorado under Regulations of the Colorado Mined Land Reclamation Board for Coal Mining (revised 09/14/2005).

1.4.2 Other Agency Plans

The BLM LSFO manages approximately 1.3 million surface acres and 1.1 million acres of mineral estate in northwest Colorado, including BLM managed surface and mineral estate in the Project area. As required by FLPMA, BLM periodically prepares and revises land use plans to determine those uses that are suitable and compatible on specific portions of the public lands, and under what conditions those uses would be authorized to mitigate potential impacts on other resource values and protect human health and safety. In the late 1960's and early 1970's, BLM prepared Management Framework Plans (MFP) as their land use plans. The MFP, which was in effect when the Federal leases for the Project were issued and which guides the BLM decisions for proposals on the subject coal leases, was the Williams Fork MFP.

Subsequent to the Williams Fork MFP, the LSFO approved the 1989 Little Snake Resource Management Plan (RMP) and associated Record of Decision (ROD) (1989, LSRMP – ROD) (BLM 1989), which superseded the Williams Fork MFP. Then in 2011, BLM approved the LSFO RMP and associated ROD (2011, LSFO RMP-ROD) (BLM 2011), which replaced the 1989 LSRMP-ROD. Colowyo's leases were issued by BLM in conformance with the decisions of the

Williams Fork MFP and therefore were established as valid existing rights (VER) prior to approval of the newer RMPs. As is recognized and stated in the 2011 LSFO RMP-ROD, a valid existing lease conveys certain rights of development to the leaseholder and a stipulation cannot be added after the lease is issued without the consent of both the lessee and lessor. Conditions of Approval (COA) and/or Best Management Practices (BMP) required by BLM in accordance with the newer RMPs would need to be consistent with the VER granted in existing leases. In this context, BLM made subsequent and periodic decisions regarding readjustment of the lease terms for each lease as required under the MLA and FCLAA. For each readjustment decision, BLM determined whether the lease terms were in conformance with the land use plan in effect at the time and in each case BLM determined the leases did conform with the plans. Further, OSMRE consulted with the BLM LSFO during the 2007 mining plan modification decision process to review and make a recommendation to the ASLM for the decision on the PR02 mining plan modification. In a letter dated May 2, 2007, the BLM LSFO determined and documented that the R2P2, which BLM approves and which is directly linked to the PR02 proposal, was in conformance with the 1989 LSRMP-ROD. In the context of this EA, BLM has again reviewed the Project and, considering VER, confirms the Project is in conformance with the 2011 LSFO-ROD.

1.5 AUTHORIZING ACTIONS

Two separate approvals are needed for a coal mine operator to conduct mining operations on lands containing leased Federal coal: 1) a SMCRA mine permit approved by the state regulatory authority, in this case, CDRMS; and 2) a mining plan or mining plan modification approved by the ASLM in accordance with the MLA.

1.6 OUTREACH AND ISSUES

Public comments were solicited through multiple methods. OSMRE published legal notices in the *Rio Blanco Herald Times* and the *Craig Daily Press* on May 21 and 22, 2015, and again on June 4 and 5, 2015, respectively (**Appendix A**). The notice described the Project in summary form, informed the public that a public outreach meeting for the EA was scheduled for June 10, 2015 at the Center of Craig facility, and that public comments would be accepted until June 15, 2015. The notice was also posted at various public locations in Craig and Meeker. An outreach letter describing the Project, announcing the public outreach meeting, and soliciting comments was mailed on May 21, 2015, to a total of 98 recipients, including BLM, Indian tribes, state agencies, city and county governments, adjacent landowners, and other interested parties. A total of 51 of the parties receiving the outreach letter, primarily private citizens, had recently expressed interest in receiving information on the proposed nearby Collom Mine Expansion project at the Colowyo Mine and thus were also included in the public outreach.

On May 28 and 29, legal notices were again published in the *Rio Blanco Herald Times* and the *Craig Daily Press*, respectively (**Appendix A**) informing the public that the meeting location had been changed to the Grandstands Building at the Moffat County Fairgrounds. In addition, on May 28, a second outreach letter was mailed to the same recipients who received the original May 21 letter, informing them of the change in location for the June 10, 2015 outreach meeting.

On May 21, 2015, OSMRE published the following Project website, which provided additional Project notice, Project information, and comment opportunities: http://www.wrcc.osmre.gov/initiatives/colowyoMineSouthTaylor.shtm.

The public outreach meeting was held on June 10, 2015, at the Grandstands Building, Moffat County Fairgrounds, 601 Victory Way in Craig from 4:00 PM until 8:00 PM. Six-hundred and thirty-two people attended and 447 submitted comment forms onsite. A total of 1,174 individuals or organizations submitted a total of 1,432 distinct comments by the end of the comment period.

The following table (**Table 1.6-1**) summarizes the comment topics by resource category.

Table 1.6-1 Public Outreach Comments Categorized by Resource Topic

Comment Category	Number of Comments	% of Total Comments
Air Quality/ *Climate Change*	155	10.82%
Grazing	1	0.07%
Reclamation	124	8.66%
Socioeconomic	507	35.40%
Vegetation	1	0.07%
Water	4	0.28%
Wildlife	66	4.61%
Topic Not Clear But Supportive of the Mine	564	39.39%
Topic Not Clear	10	0.70%
Total	**1,432**	**100%**

The comments received during the public outreach comment period varied widely but the overall majority indicated either direct support for the continuation of Colowyo's mining operation or identified a wide range of benefits of their mining activity. More than a third of the comments were statements of support for the continuation of mining at the mine. Another roughly third of the comments addressed socioeconomic effects. Some of this group focused on the potential for the mine to shut down and the potential adverse socioeconomic effects of that action, such as loss of income, on individuals, families, local businesses, and local communities. In addition, a number of the latter comments identified the beneficial impacts the Colowyo mining operation has historically had on the economy and quality of life in Craig and greater northwestern Colorado, such as providing jobs, supporting the need for related businesses, and attracting major retail stores to Craig. Other comments addressed the beneficial effects of Colowyo's reclamation efforts on big game and other wildlife through improved habitats post mining and that Colowyo's reclamation operations have been recognized through receiving awards. Some of the comments identified the beneficial effects of Colowyo's mining operation on wildlife by providing personal observations of greater wildlife numbers within the mine permit boundary than outside the boundary.

Commenters also raised several concerns over the potential adverse impacts of the Project on a number of resources. Almost 11 percent of the comments addressed air quality*, including climate change*. Some expressed anecdotal observations about the air quality in northwest Colorado in proximity to the Craig Generating Station, asserting that the quality of the air in this area is as good or better as other parts of the state. Others expressed concern about the adverse effects of coal combustion on air quality and the need to carefully evaluate and consider its impacts. In particular, some commenters identified concerns over the potential impacts on air quality from mining operations, coal transportation, and burning coal, including impacts to climate change from greenhouse gases (GHGs) and the social costs of carbon emissions. Other air quality impact concerns raised by one commenter include: impacts of mining to national ambient air quality standards (NAAQS), particularly for ozone; particulate matter and nitrogen; and impacts on threatened and endangered fish species in the Yampa River, and their habitats, from the associated regional deposition of combustion byproducts such as mercury from the Craig Generating Station. Comments also raised concerns over impacts to surface water quality especially with regard to possible contributions of the Project to existing water quality problems, such as the state identified exceedance of iron standards in the Yampa River.

Comments also identified alternatives to the Project that could be analyzed. These alternatives included: reduced mining levels, underground mining, reduced air quality impacts including reduced GHGs, and an alternative that would require offsite mitigation or compensation for impacts. These alternatives and reasons for dismissing or carrying them forward for analysis are addressed in **Chapter 2**.

All outreach comments received have been considered and included as appropriate in the preparation of this document.

CHAPTER 2 PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

This chapter describes the alternatives considered and analyzed in detail: Alternative A (the Proposed Action), Alternative B (PR02 as Revised), and the No Action Alternative. In addition, it identifies alternatives considered but eliminated from detailed analysis.

Alternative A, the Proposed Action, goes back in time to 2007, as if no mining or related surface disturbance for PR02 has yet occurred. This alternative is based on the mining plan modification submitted for PR02, which was *first* analyzed in OSMRE's EA prepared in May 2007 and approved by both CDRMS and the ASLM in June 2007 (PR02 as Approved in 2007). This unusual approach is necessary to effectively address the court order direction to re-evaluate the mining plan modification that OSMRE had previously analyzed under NEPA in 2007. *Alternative A* is described below with the information that would have been available to OSMRE back in 2007. PR02 as Approved in 2007 added approximately 6,050 acres to the previously approved permit area, (i.e., PR01), extending surface coal mining operations into those portions of federal leases COC 29225 and COC 29226 that were not included in PR01. PR02 as Approved in 2007 also included undeveloped federal coal lease COC 12347601, along with additional private lands, in the Lower Wilson Area. *At that time* Colowyo indicated *this undeveloped lease* may be proposed for surface mining in the future. This Alternative uses the assumption that mining would continue under PR02 as Approved in 2007 without any additional revisions. In accordance with PR02 as Approved in 2007, mining was planned to be completed in 2017 and the South Taylor final pit closure was also planned to commence in 2017.

Since June 2007, however, Colowyo has been mining under PR02 and has already disturbed approximately 789 acres *of previously undisturbed land* over the past 8 years. However, it is important to understand that mining is a dynamic process that requires continual collection, interpretation, and analysis of new geologic and engineering data as the operation progresses. This process results in constant refinement of the geologic and engineering models used for planning future mining operations. Changes in mining operations require the company to revise the Permit over time through the CDRMS revision process, in order to most efficiently mine the coal. Pursuant to its delegated SMCRA permitting authority, CDRMS has approved a number of *minor* revisions to PR02 as Approved in 2007, which have changed the mining and reclamation plan approved in 2007 *but did not require approval of a mining plan modification by the ASLM*.

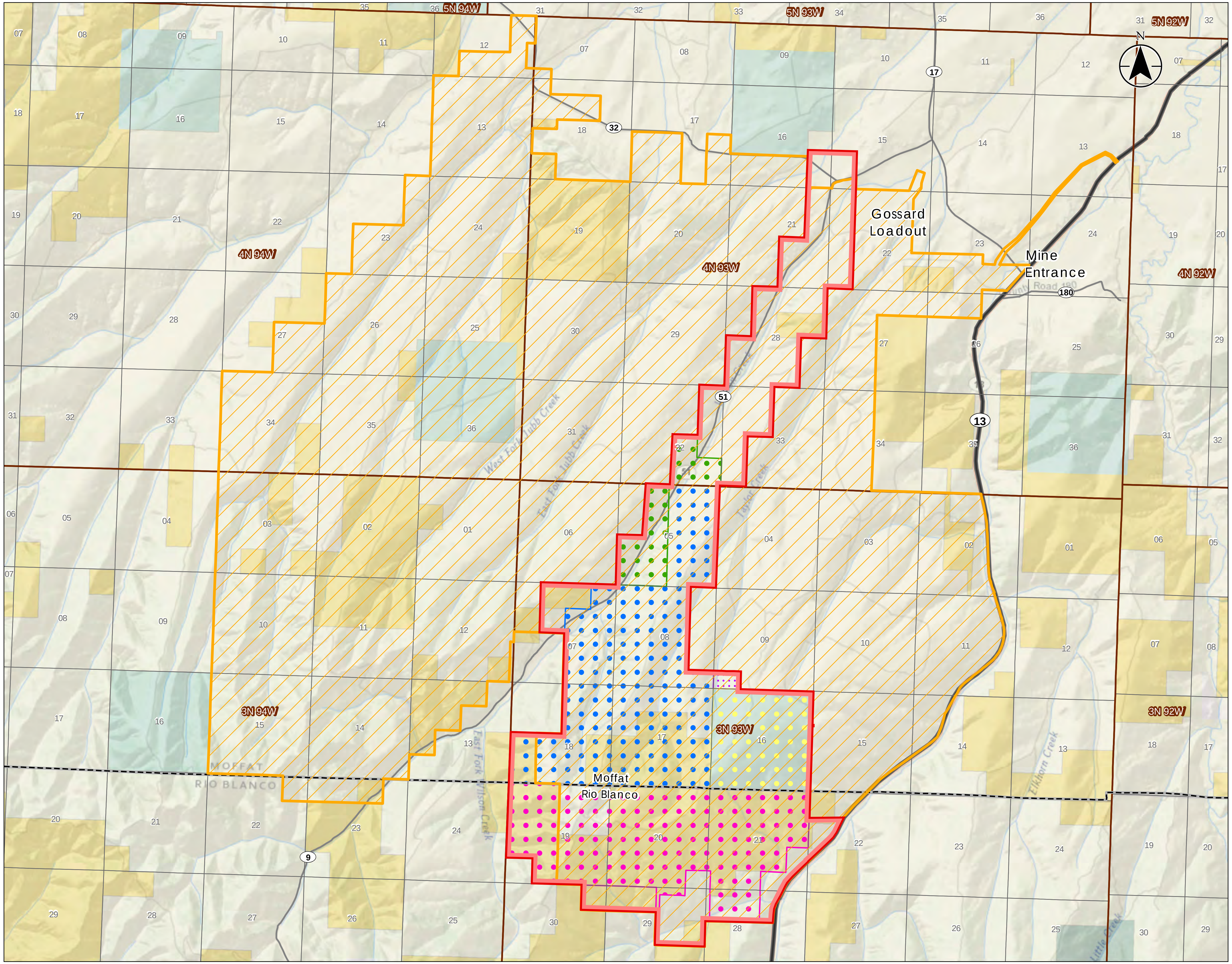
Alternative B spans the timeframe from 2007, after approval of PR02 and starting with the commencement of operations, through the present, inclusive of the mining operations and disturbance that have already occurred over the last 8 years. Further, this alternative includes the *reasonably foreseeable* future mining operations to be conducted over the next four years, and projected to be completed in 2019 when reclamation would begin. In other words, Alternative B is based on PR02 as currently implemented, inclusive of all revisions approved between 2007 and the present. In general, when compared with Alternative A, Alternative B (PR02 as Revised) has a lower production rate, results in less surface disturbance, and recovers less coal over the life of the Project. Greater detail regarding the currently approved PR02 (Alternative B), which consists of additional descriptions, maps, and drawings contained in the PAP, is available at the Colowyo Mine Administration Office at: 5731 State Highway 13, Meeker, CO 81641; the CDRMS office at: 1313 Sherman Street Denver, CO 80203; and the OSMRE at: 1999 Broadway, Suite 3320 Denver, CO 80202.

The No Action Alternative, Alternative C, like Alternative B (PR02 as Revised), spans the timeframe from when operations commenced in 2007 after the initial approval of PR02, through the present, inclusive of the mining operations and disturbance that have already occurred. However, under this alternative, the ASLM would not approve the mining plan modification for PR02, which would require termination of mining of federal coal in the Project Area in September 2015 and immediate reclamation of the Project Area in accordance with the permit and federal lease terms.

For the purposes of this EA, the Project Area boundary (**Figure 2-1**) includes all areas potentially affected by Alternatives A and B. The Project Area boundary also includes all of the areas of PR02 that have already been affected since mining development began in 2007, as well as portions of non-federal lands previously permitted for mining, such as State Lease 257-13s and portions of federal leases COC 29255 and COC 29256, also previously permitted for mining. *Coal has been actively mined from the Project Area from 2008 until present.* Approximately 789 surface acres *of previously undisturbed land* in the Project Area have already been disturbed *under Alternative B*; this accounts for approximately *66.8* percent of the *new* surface disturbance anticipated under Alternative A and 97.5 percent of the *new* surface disturbance anticipated for Alternative B. The Lower Wilson Area has not been proposed for mining under either Alternative A or Alternative B and Colowyo indicates that it has no future plans for mining in that area.

The Project Area is located immediately west, southwest, and northwest of the mining operations occurring in 2007 in the West Pit. The Project Area boundary (**Figure 2-1**) includes the three federal coal leases noted above (COC 012347601, COC 29225, and COC 29226), and a very small portion of an additional federal lease COD 034365 underlying private lands owned by Colowyo, portions of State of Colorado lease 257-13s, and other private lands. *Federal lease COD 034365 was issued in October 1924 and assigned to Colowyo in April 1946.* The Project Area boundary encompasses 7,115.54 acres and includes all or portions of:

> Township (T) 3 North (N), Range (R) 93 West (W), 6th Prime Meridian (PM), Sections 5, 7, 8, 9, 16, 17, 18, 19, 20, 21, 22, 28, 29, and 30;
>
> T4N, R93W, 6th PM, Sections 15, 16, 21, 22, 28, 32, and 33.



Project Area

Approved SMCRA Permit Area

Lease Area

COC 029225

COC 029226

COC 012347601

COD 0034365

257-13s

County Road

Highway

Section Boundary

Township Boundary

County Boundary

Land Status

Bureau of Land Management

Private

State

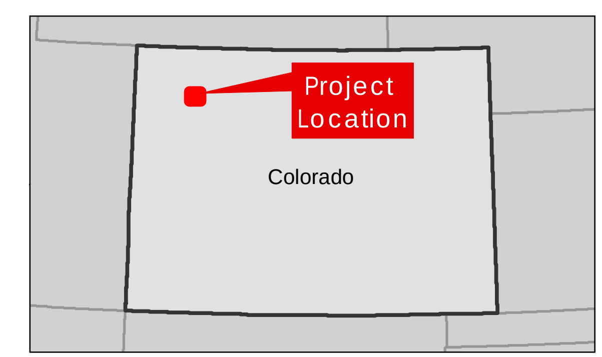
State, County, City - Park/ Outdoor Rec Areas

0 1 2 miles

1:63,360 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.



Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.

2-1

Title

Project Area

The following are the legal descriptions of those portions of the federal leases included within the Project Area:

Lease COC 29225

T3N, R93W, 6th P.M.
Section 5: lots 1 and 2, S1/2 NE1/4, SE1/4;
Section 7: NE1/4NE1/4, S1/2NE1/4, SE1/4;
Section 8; S1/2SE1/4SE1/4, W1/2E1/2, W1/2;
Section 17: All;
Section 18: lots 3 and 4, E1/2, E1/2SW1/4;

Lease COC 29226

T3N, R93W, 6th P.M.
Section 19: lots 1-3, E1/2, E1/2W1/2;
Section 20: lot 1, N1/2, SW1/4, N1/2SE1/4, SW1/4SE1/4;
Section 21: TR 47 lots 6, 8; lots 1, 3, 5, 7, 10, N1/2, N1/2SW1/4, NW1/4SE1/4;
Section 28: TR 47 lots 4, 5, 8, 12, 13, 15; lots 6, 24;
Section 29: lots 2, 3, 13;

Lease COC 012347601

T4N, R93W, 6th PM
Section 5: SW1/4; E1/2NW1/4;
Section 32: lot 4, S1/2SE1/4;

Lease COD 034365

T3N, R93W, 6th P.M.
Section 9: S1/2SW1/4SW1/4

2.2 Alternative A – Proposed Action – PR02 as Approved in 2007

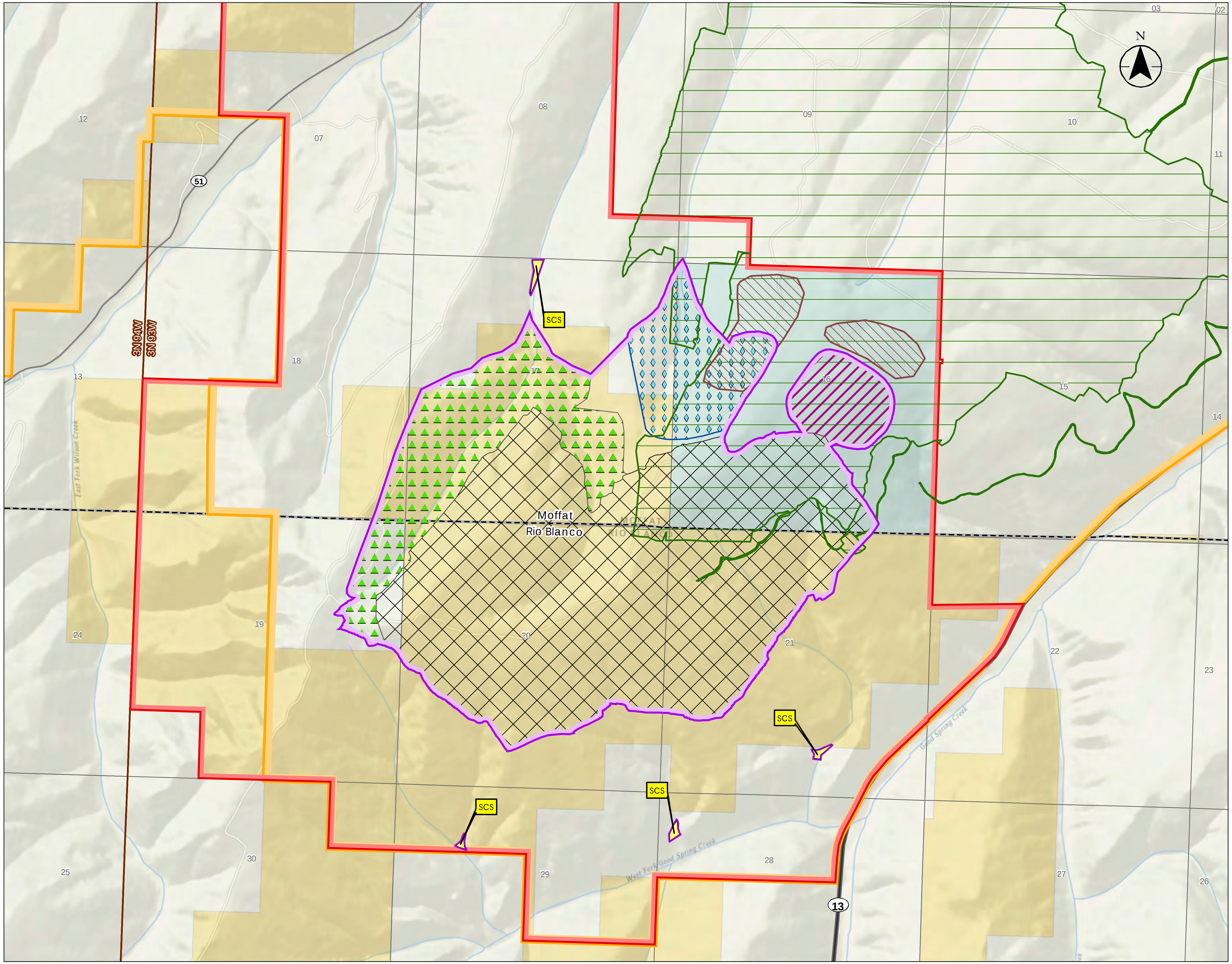
Alternative A reflects Colowyo's original proposal for mining the South Taylor/Lower Wilson Permit Expansion Area as presented to CDRMS in 2006 and approved by CDRMS, OSMRE, and the ASLM in 2007, and projects the same level of activity approved in 2007 would continue for the life of the Project. The 2007 approved mining plan modification included the following: mining approximately 43 million tons of federal coal; mining at a maximum rate of up to 6 mtpy; disturbing up to 1,562 acres of surface land within the permit area (**Figure 2-2**); and conducting mining operations from 2008 through 2017.

2.2.1 Proposed Mine Operation Components in 2007

The operation plan for PR02 as Approved in 2007 included the following mine components and facilities:

- One open pit, the South Taylor Pit, to access the coal seams, including by highwall mining methods;
- Two permanent and two temporary stockpile areas to store spoil material removed prior to mining for use in backfilling the open pit during reclamation;
- Dispersed facilities necessary to conduct mining operations including:
    - Temporary light use roads;
    - Temporary stockpile areas to store topsoil removed from disturbed areas for use in reclamation;
    - A 69 kilovolt (kV) power line and associated power poles within the area of mining operations to power the dragline and shovel;
    - Temporary berms;
    - Waterlines;
    - Temporary construction staging areas;
- Sediment ponds and diversion ditches.

Colowyo's original 2006 PAP submittal to CDRMS proposed to disturb a total of approximately 1,562 acres as described in ***Table 2.2-1****. Most of the proposed disturbance would occur as new disturbance both within the applied for expansion area (PR02) and within the existing permit area (PR01), totaling 1,180.7 acres. (Total of Columns (A) + (B) in* ***Table 2.2-1****). It is not uncommon that a proposed permit expansion project area would overlap with an existing operation, disturbing areas that were already disturbed under a previous permit approval. Disturbance within the existing permit area would also occur on lands that were: 1) currently disturbed and with no re-grading or ongoing reclamation; and 2) previously disturbed and that were re-graded and may also be undergoing reclamation efforts. The balance of the Alternative A's proposed disturbance would occur on lands already disturbed under previous permit approvals, as described in 1) and 2) above, totaling 381.3 acres (Total of columns (C) + (E) in* ***Table 2.1-2****). Under CDRMS' SMCRA responsibilities and authority, the agency decides whether or not to approve areas of new disturbance (lands not previously approved by CDRMS for disturbance) and areas of re-disturbance (lands approved by CDRMS for disturbance under a previous permit revision and for which re-grading and/or reclamation activities have begun). PR02 as Approved in 2007 included a combined total of 1,532.6 acres of new disturbance and re-disturbance acres approved by CDRMS. The remaining 29.4 acres of the 1,562 acres proposed for disturbance in Colowyo's 2006 PAP would occur on lands previously approved by CDRMS for disturbance, but for which no regrading had yet occurred and also for which no reclamation activities had yet been initiated. CDRMS does not consider disturbance for the latter such lands as part of the overall acres of disturbance reported when processing permitting actions.*



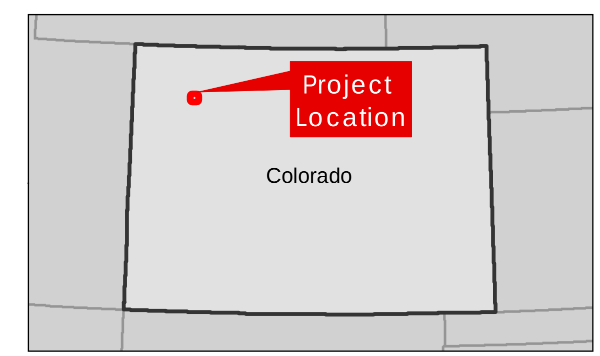
Project Area
Approved SMCRA Permit Area
Proposed Disturbance Area
Disturbance not associated with PR 02
Topsoil Stockpile
Sediment Control Structure (SCS)
East Taylor Fill
West Taylor Fill
Temporary Spoil Pile
South Taylor Pit Shell
County Road
Highway
Section Boundary
Township Boundary
County Boundary

Land Status

Bureau of Land Management
Private
State

0 2,000 4,000 Feet
1:24,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.



Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
2-2

Title
Alternative A Mine Components and Proposed Disturbance Area

Table 2.2-1 Alternative A Proposed Disturbance Acreage by Project Component

Project Component	(A) DRMS Approved New Disturbance in the Expanded Permit Area	(B) DRMS Approved New Disturbance in the Existing Permit Area	(C) DRMS Approved Re-Disturbance in the Existing Permit Area	(D) Subtotal DRMS Approved Disturbance	(E) Acres Disturbed in Previously Disturbed and Un-Reclaimed lands in the Existing Permit Area	(F) Total Acres Proposed to be Disturbed under Alternative A
Pit	646.3	162.7	172.1	981.1	0	981.1
East Taylor Fill	0	59.8	76.2	136.0	0	136.0
West Taylor Fill	248.9	12.0	0	260.9	0	260.9
Between Fills	8.5	26.7	9.4	44.6	0	44.6
Temporary Fill	0	0	70.2	70.2	0	70.2
West Taylor Pond	5.7	0	0	5.7	0	5.7
Sec 21 Pond	6.6	0	0	6.6	0	6.6
Sec 28 Pond	2.1	0	0	2.1	0	2.1
Pond Roads	1.4	0	0	1.4	0	1.4
Topsoil Stockpiles	0	0	24	24	29.4	53.4
Totals	919.5	261.2	351.9	1,532.6	29.4	1,562

2.2.2 Methods and Operation

In its original application for PR02, Colowyo proposed to utilize truck/shovel, dragline, and highwall surface mining techniques, which it has used in other parts of the mine since 1977.

In general, the following mining operation sequence was proposed to be implemented although some activities would occur concurrently or overlap:

- Construct sediment ponds and diversions ditches;
- Strip and stockpile topsoil from areas to be mined and disturbed;
- Begin removing spoil material from the South Taylor Pit area;
- Develop two temporary spoil stockpiles;
- Begin reclamation during mining operations;
- Complete mining of the South Taylor Pit; and,
- Complete reclamation.

All truck haul and access routes within the South Taylor/Lower Wilson Permit Expansion Area that connect the South Taylor Pit to the existing operation were proposed to be constructed as in-pit truck routes.

Existing mine support facilities, located approximately 3.5 miles (5.6 km) north of the South Taylor area, would be used for the mining operation. These existing facilities include an office building, machine shop, warehouse, welding shop, tire bay, wash bay, maintenance shop, parking lot, explosives storage facility, and an oil and fuel storage area.

Explosives would be used to fragment the spoil material. Blasting would be conducted in accordance with the procedures and specifications presented in the approved surface mining permit.

Under this alternative, truck/shovel operations would remove the upper three layers of spoil material, and the dragline would remove the final layer of spoil material. The South Taylor Pit would be 8,835 feet long by 7,005 feet wide and 580 feet deep covering approximately 981 surface acres. The initial material excavated from the South Taylor Pit (also known as the boxcut) would be placed in two permanent valley fills, the East Taylor and West Taylor Fills, which would also be designed to contain approximately 60 million cubic yards of spoil material. Following development of the boxcut, spoil material from the upper seams, of the South Taylor Pit would be hauled to two temporary spoil piles. One would be constructed on top of the East Taylor Fill and the other directly east of the East Taylor Fill, within a previously mined and reclaimed pit called the Section 16 Pit (**Figure 2-2**). The dragline spoils would remain in the pit.

Prior to PR02 as Approved in 2007, the average production rate for the Colowyo mine outside the Project Area was approximately 4.5 mtpy. PR02 as Approved in 2007 allows a maximum production rate of 6.0 mtpy for the life of the Project Area. The time anticipated to mine the coal under this Alternative would be approximately ten years, from 2008 to 2017.

Recovered coal under this Alternative would be trucked to an existing primary crusher and an existing coal stockpile located just north of the West Pit. From there coal would be trucked to an existing secondary crusher and coal stockpile located approximately four miles (6.4 km) north at the Gossard Loadout. From the loadout, coal would be transported to coal markets by rail in unit trains, i.e. "a railway train that transports a single commodity directly from producer to consumer" (Merriam-Webster 2015).

Under Alternative A, the proposed reclamation objective would be to restore the disturbed areas to the pre-mining use of rangeland, capable of supporting both domestic livestock and wildlife. Re-grading and topsoil placement would occur in accordance with the approved reclamation plan and while mining is ongoing.

2.2.3 Project Design Features

The surface mining permitting process under the State of Colorado's coal regulatory program requires applicants to incorporate design features into their mining proposals to protect or minimize impacts to a wide variety of environmental resources (CDRMS 1980). Examples of such environmental resources include water, air, fish, and wildlife. Each PAP submitted to CDRMS for a new or revised mining permit is required to contain a number of resource specific plans. The resource specific plans describe the proposed mine's (or proposed mine revision's) design features for reducing or eliminating the potential impacts to various resources or how those resources will be restored to pre-mining conditions after mining is complete. CDRMS reviews the PAP, which includes the required resource specific plans, design features, and associated performance standards. If the PAP meets the state standards, CDRMS approves the PAP. The CDRMS approval commits the applicant to implementing the design features contained in the PAP. It is important to note that the design features of the original permit also apply to the newly revised permit, unless CDRMS approves any changes to the revised permit that would replace older design features.

In Colowyo's case, CDRMS approved Colowyo's original surface mining permit in 1982 (C-1981-019). PR01 for the West Pit was approved in July 1992, and PR02 for the South Taylor/Lower Wilson Permit Expansion Area was approved in June 2007. The PAP, for PR02, incorporated new design features, as well as retained the design features that were included in the original permit approval and those included in the PR01 approval. A summary of the design features to reduce or eliminate potential impacts to environmental resources that were incorporated in PR02 as Approved in 2007 and are included in the analysis of Alternative A are included in **Table 2.2-2**, and a more detailed description of the design features is included in **Appendix B**.

Table 2.2-2 Summary of Principal Design Features

Resource Area	Measure
Topography	Restore the area to approximate original contours (AOC). Grade backfilled mining areas to establish a stable post mine topography that blends into the undisturbed areas outside the mining limits. Grade final slopes to not exceed the approximate original pre-mining slope grade. Grade all final slopes so that overall grades do not exceed 33%. Blend the highwall into the backfilled material to result in a natural and gradual slope change. For a more detailed description of design features, refer to the Reclamation Plan (Appendix B).
Air Quality	Water haul roads as necessary to control fugitive dust. Obtain a CDPHE Air Pollution Control Division Construction Permit (modification to current permit) (Note: Approval conditions are included in Colowyo's Air Pollution Control Division permit – such as the Fugitive Dust Control Plan (as an appendix to the permit)). For a more detailed description of design features, refer to the Air Quality Control Plan (Appendix B).
Water Resources	Construct new sedimentation structures and diversion ditches to control runoff, avoid erosion and an increased contribution of sediment load to runoff, and protect surface and ground water quality. Control and monitor the quantity and quality of any discharges from the permit area in compliance with the National Pollutant Discharge Elimination System (NPDES) Permit (Number CO-0045161 issued by the CDPHE). Designate stream buffer zones and install sedimentation ponds on the drainages from disturbed areas feeding into surface water features. Retain drainage off the "in-pit" roads in the pit or divert to drainage and sediment control structures. Line channels with rock riprap and install energy dissipaters when necessary. Seed the entire embankment of all sedimentation ponds, including the surrounding areas disturbed by construction, after the embankment is completed. Design sedimentation ponds to treat the theoretical 10-year, 24-hour storm event and contain the theoretical 25-year, 24-hour storm event. Construct small impoundments on reclaimed areas to collect surface runoff from precipitation events and snowmelt from reclaimed areas. Where practicable, use diversion methods to change the flow of water from undisturbed areas so as to bypass the disturbed areas rather than using treatment facilities. Direct all surface runoff from the disturbed areas through sedimentation ponds. For a more detailed description of design features, refer to the Protection of the Hydrologic Balance Section and Performance Standards 4.05 Hydrologic Balance (Appendix B).
Vegetation	Manage livestock (cattle) grazing to select against grasses resulting in increased shrubs and forbs. Use elk-proof fencing to preclude access into large blocks of maturing shrub populations, especially core areas. In concert with CPW, use hunting pressure to reduce elk utilization of new reclamation areas where it can be incorporated in a safe manner given proximity to active mining. Use orchard grass (*Dactylis glomerata*) in key reclamation locations to encourage elk to move away from maturing shrub populations. Implement procedures for micro-habitat development whereby snow catchment is encouraged and shrub heavy mixes can be applied.

Resource Area	Measure
Vegetation	Interseed shrubs (as necessary as a normal husbandry practice) in areas not exhibiting satisfactory establishment of shrubs, but with opportunities (micro-niches) for shrub establishment. Fence reclaimed areas as appropriate, if necessary, to manage grazing or browsing by livestock or wildlife. For a more detailed description of design features, refer to the Reclamation Plan (Appendix B).
Fish and Wildlife	Revegetate for big game benefit/use. Construct power lines to Avian Power Line Interaction Committee (APLIC) standards. Implement construction guidelines for retrofitting existing power poles to protect raptors. Limit vehicle speeds in the mine area to reduce the likelihood of collisions with wildlife. Provide topographic relief for wildlife habitat. Reestablish escape cover, south facing slopes for wintering big game populations and small drainages suitable as future location of stockponds, necessary to achieve the post-mining land use. For a more detailed description of features, refer to the Fish and Wildlife Plan (Appendix B).
T&E Species	Continue the established practice of clearing areas of thick brush and decadent stands of the mountain shrub vegetation within and adjacent to the lease area as part of the big game mitigation program production of succulent herbaceous vegetation and provide more forage for the Greater sage grouse brood population. Continue collaboration with CPW for Greater sage grouse studies. Implement measures required as part of the Endangered Fish Recovery Agreement with USFWS.
Cultural Resources	Perform pre-disturbance field surveys.
Visual Resources	Restore disturbed areas to original contours. For a more detailed description of design features, refer to the Reclamation Plan (Appendix B).
Soils	Construct a drainage control bench or furrow, where necessary, to slow water flow on the longer slopes and minimize erosion. Provide a buffer zone between the area disturbed by mining and the area where topsoil has not been removed. Restrict non-essential vehicular traffic from undisturbed area. Construct topsoil stockpiles with outside slopes no steeper than 3h: 1v. Locate topsoil stockpiles to avoid erosion from wind and water and additional compaction or contamination. Protect topsoil stockpiles from wind erosion by planting a perennial mixture as soon as conditions allow. No topsoil stockpiles will be placed in a drainage bottom where external erosion might pose a potential threat. Mark all topsoil stockpiles with identifying signs. If soil compaction is a problem, rip the soil with a dozer to minimize compaction, assure stability, and minimize slippage after topsoil replacement. Develop concave landforms (to encourage snow entrapment) on a case-by-case basis. Leave reapplied topsoil in a rough condition to help control wind and water erosion prior to seeding. For more detailed description of design features, refer to the Reclamation Plan (Appendix B).

2.3 Alternative B – PR02 as Revised

Alternative B reflects the surface disturbance and mining operations that have actually occurred in the South Taylor/Lower Wilson Permit Expansion Area since 2007 as the result of subsequent revisions to PR02 approved by CDRMS, and those effects that are *reasonably anticipated* to occur throughout the remaining life of the Project under the currently approved PR02. In *general*, when compared with Alternative A, Alternative B (PR02 as Revised) *has* less acreage disturbed, less coal mined, and a lower annual production rate. This reduced level of mining and surface disturbance is expected to continue under this alternative.

Under Alternative B, Colowyo has already disturbed approximately 789 acres *of previously undisturbed land* over the past 8 years. This accounts for approximately 97.5 percent of the *new* surface disturbance *(previously undisturbed land)* expected under Alternative B because future mining activities under this Alternative are anticipated to occur within areas that have already been disturbed with the exception of a small amount of additional surface disturbance (approximately 20 acres) that is planned during reclamation operations to allow for the topography of disturbed areas to be blended back to the pre-mining state.

Under Alternative B, it is anticipated that approximately 23.3 million tons of federal coal will be extracted, which is about 20 million tons less than the 43 million tons in Alternative A (PR02 as Approved in 2007).[1] Based on ongoing geologic and engineering work performed after the approval of PR02 in 2007, Colowyo applied for and received a R2P2 modification from BLM *in 2014*. This R2P2 modification reflected a determination that approximately 20 million of the 43 million tons originally approved by BLM for mining was no longer economically recoverable. As explained below, it is common for actually-recoverable coal to differ from the originally approved tonnage, as additional experience and data is gathered and the geologic model is updated. Alternative B also analyzes mining at a maximum rate of 5.0 mtpy from 2008 through 2014 instead of the 6.0 mtpy under Alternative A, and mining at a maximum rate of 4.0 mtpy from 2015 until the end of mining in about 2019. These rates reflect recent production experience and are the best estimates of rates that are reasonably *foreseeable* given the remaining reserves.

Under Alternative B, the life of the Project is projected to be from 2008 through 2019. This estimate is based on the actual production rate that has ranged from a high of about 4.95 mtpy in 2008 to a low of about 2.1 mtpy in 2012 for the mine as a whole. For the time period from 2008 to 2014, the South Taylor Pit produced coal at an average rate of 1.47 mtpy, ranging from a high of about 1.84 mtpy to a low of about 1.18 mtpy. Production primarily from the previously permitted West Pit accounted for the balance of the production from the mine as a whole through 2014 when the West Pit operation ceased. The previously permitted Section 16 Pit also contributed small amounts to the mine production through 2013 when operations in that pit ceased. Based on remaining coal reserves and the actual 2014 production rate of 2.48 mtpy, mining at the South Taylor/Lower Wilson Permit Expansion Area, this alternative

[1] Of this 23.3 million tons of coal, approximately 10 million tons have already been extracted from the South Taylor Pit since 2008.

projects that mining would be completed in the Project Area in approximately four years, or 2019.[2]

From 2008 through 2014, the Colowyo coal mine produced a total of 20,446,445 tons of coal from all permitted operations (Section 16 Pit, West Pit, and South Taylor Pit) at an average production rate of 2.92 mtpy. Between 2008 and 2014, a total of 10,314,641 tons were produced from just the South Taylor Pit. Under this alternative, mining would continue at the 2014 production rate of approximately 2.48 mtpy and approximately 13 million tons of additional coal is projected to be mined from the South Taylor Pit over approximately the next four years. Under this alternative, the total amount of coal already mined and projected to be mined from the South Taylor Pit is about 23.3 million tons—a reduction of about 20 million tons from that projected under Alternative A.

Under Alternative B, approximately 13 million tons of recoverable coal remains to be mined in the South Taylor/Lower Wilson permit expansion area. Surface mine reserves for the South Taylor Pit are calculated using the geologic model. The geologic model is constructed using drill data collected during exploratory drilling projects as well as periodic in-pit drilling projects. The drilling data is used to develop three-dimensional models of the coal seams that are then used to calculate a projected amount of recoverable coal. The projected amount of recoverable coal is fully contained within the selected pit shell. Recovery percentages are estimated for the target coal seams and a contingency value of 10 percent is projected to address seam thicknesses when recoverable tons are estimated.

Under this alternative, the reclamation objective for the South Taylor area is to restore the mined area to a land use capability that will be equal to or better than that which previously existed. Ultimately, the areas being mined will be returned to their original use as rangeland, and the watersheds affected by the mined areas will be restored to their approximate pre-mining character. Specifically, Colowyo proposes to reclaim the mined areas to a rangeland condition capable of supporting both domestic livestock and wildlife. Reclamation, including backfilling and grading, replacement of topsoil, and the re-vegetation of approved flora, has already *occurred at the mine*, and, under this alternative, we expect this to continue in accordance with the revised PR02. Of the 789 acres of *new disturbance that has already occurred, approximately 62 acres* have been reclaimed with regrading, topsoil, and reseeding. Colowyo *is currently self-bonded for $80,517,829 which is the total liability for the existing mining operation and which includes the existing East, West, and South Taylor Pits and the supporting infrastructure. Colowyo's self-bond will* ensure that reclamation for the Project is completed in accordance with the permit, State rules, and SMCRA.

2.3.1 CDRMS Approved Revisions to the Permit 2008 - Present

In 2008, Colowyo began mining at the South Taylor Pit, which has continued to the present. However, as described in **Section 2.3** above, this mining has conformed to numerous revisions approved by CDRMS to PR02 as Approved in 2007. These revisions reflect the fact that mining is a dynamic process that requires continual collection, interpretation, and analysis of new

[2] In contrast, under Alternative A, the maximum production rate for the mining operation is expected to increase from 4.5 mtpy to up to a maximum of 6.0 mtpy and the for the life of the mine, which would be from 2008-2017.

geologic and engineering data as the operation progresses. This process results in constant refinement of the geologic and engineering models that are the basis for mine operation decisions. The CDRMS coal mine permitting program is authorized under the Colorado Surface Coal Mining Reclamation Act of 1979 and has been approved by the Secretary as provided for in SMCRA. The program is implemented through the regulations of the Colorado Mined Land Reclamation Board for Coal Mining. It provides mine permittees the opportunity to submit for review and approval, if appropriate, of a variety of potential revisions of approved mining permits, depending on the nature of the proposed revision.

Those revisions are defined in state regulations as follows:

"'Minor revision' means a modification in permit provisions to reflect minor alterations in the location of roads or other facilities within the permit area, minor alterations in the timing or sequencing of mining or reclamation plans approved in accordance with the requirements of these Rules or other minor alterations in surface coal mining and reclamation operations which shall not cause a significant alteration in the permittee's reclamation plan." (CDRMS 1980, revised 2005)

'Technical revision' means a minor change, including incidental permit boundary revisions, to the terms or requirements of a permit issued under these Rules, which change shall not cause a significant alteration in the operator's reclamation plan. The term includes, but is not limited to, increases in coal production, reduction or termination of approved environmental monitoring programs, or design changes for regulated structures or facilities." (CDRMS 1980, revised 2005)

'Permit revision' means a significant alteration of the terms or requirements of a permit issued under the Rules and the Act, including, but not limited to, significant changes in the reclamation plan, and other actions which the Board may by regulation prescribe. 'Permit revision' does not include a technical revision as defined in 1.04(136)." (CDRMS 1980, revised 2005)

Whenever CDRMS determines that a revision may result in the mining of leased federal coal, the State notifies OSMRE. OSMRE then makes a determination as to whether the revision triggers preparation of a mining plan or mining plan modification, and proceeds accordingly.

Under the state coal mine permitting rules, *surface mining permits are valid for a term of five years with a right of renewal.* CDRMS is also required to perform a review of existing permits at the permit midterm and, during that review process, it may require revision or modification of permit provisions to ensure compliance with the Colorado Surface Coal Mining Reclamation Act of 1979 and state rules. *In order to ensure compliance with reclamation and other permit requirements*, CDRMS performs monthly inspections of the Project. In addition, valid existing permits have the right of successive renewal at the end of the permit term, with the approval of CDRMS. Through the application process for a permit renewal, CDRMS may also require revision or modification of permit provisions. (CDRMS 1980, revised 2005)

Mining in the South Taylor Pit has progressed from 2008 under the revised PR02, and as is typical with most Colorado mines, a number of revisions have been approved by CDRMS. A total of 45 Minor Revisions, 34 Technical Revisions, 2 renewals, and 1 midterm review of PR02 have been approved by CDRMS since 2007, some of which have resulted in changes to the original plan as reflected in the PR02 as Approved in 2007. *However, none of these revisions required approval of new mining plan modification.* The resulting current configuration and existing disturbance area of the South Taylor operation is shown in **Figure 2-3**. Some of the more substantial changes to revised *PR02 that did not require approval by the ASLM* since it was originally approved are described below:

- A technical revision moved the locations of the two temporary spoil stockpiles to the west. In Alternative A, two temporary spoil stockpiles would be constructed, one on top of the East Taylor Fill and the other directly east of the East Taylor Fill within a previously reclaimed area called the Section 16 Pit. Under Alternative B, the two temporary spoil stockpiles were actually constructed on top of the West Taylor Fill and on top of the East Taylor Fill avoiding the reclaimed area and further disturbance of approximately 70 acres of re-established vegetation.

- A technical revision reduced the surface disturbance by a total of 450 acres for Alternative B by relocating spoil stockpiles to fill areas.

- A technical revision reduced the disturbance footprint of the South Taylor Pit. In Alternative A, the South Taylor Pit would be 8,835 feet long by 7,005 feet wide and 580 feet deep covering approximately 981 acres. In Alternative B, the pit as it is currently configured is 4,974 feet long by 4,138 feet wide and 440 feet deep, covering approximately 429 acres, a reduction of disturbed acres by about 44 percent when compared to Alternative A.

2.3.2 Currently Approved Mine Operation Components

The Alternative B operation plan includes the following mine components and facilities:

- One open pit, the South Taylor Pit, to access the coal seams, including a highwall mining operation;
- Two permanent and two temporary spoil stockpile areas to store spoil permanently and during mining for use in backfilling the open pit during reclamation;
- Dispersed facilities necessary to conduct mining operations including:
  - Temporary light use roads;
  - Temporary topsoil stockpile areas to store topsoil removed from disturbed areas for use in reclamation;
  - A 69 kV power line and associated power poles within the area of mining operations to power the dragline and shovel;
  - Temporary berms;
  - Waterline and storage tank; and,
  - Parking lot, first aid building, and a fuel island.
- Sediment ponds and diversion ditches.

The total acreage proposed to be disturbed for the Project components under Alternative B is 1,250 acres (**Table 2.3-1**). PR02 as Revised in 2007 would disturb 809 acres of previously undisturbed land and 441 acres of land previously disturbed under PR01, including some land under partial or final reclamation. It is not uncommon that a proposed permit expansion project area would overlap an existing operation and plan to disturb areas that were already disturbed and/or in various stages of reclamation.

Since 2007, 789 acres of previously undisturbed land have now been disturbed by Alternative B mining activities. From now until the proposed completion of mining, all mining activities would occur within areas that are already disturbed. All facilities supporting the mining operation have been constructed. An additional 20 acres would be disturbed during final reclamation operations. Upon completion of Alternative B there would be a total new disturbance of 809 acres that had not previously been disturbed within the permit area. This is *371.7* acres less than the *1,180.7* acres of undisturbed land proposed to be disturbed under Alternative A.

Table 2.3-1 Alternative B Proposed Acreage by Project Component

Project Component	Total Acres Disturbed for Each Component	Previously Disturbed Acres	Previously Undisturbed Acres
South Taylor Pit	429	19	410
Temporary Spoil Stockpiles	310	136	174
Permanent Spoil Valley Fills (East and West Taylor)[1]	287	214	73
Sediment Ponds & Ditches	8	0	8
Temporary Topsoil Stockpiles	69	62	7
Other Disturbed Areas	61	6	55
Reclaimed Areas	66	4	62
Future Disturbance	20	0	20
Total Acres	1,250	441	809

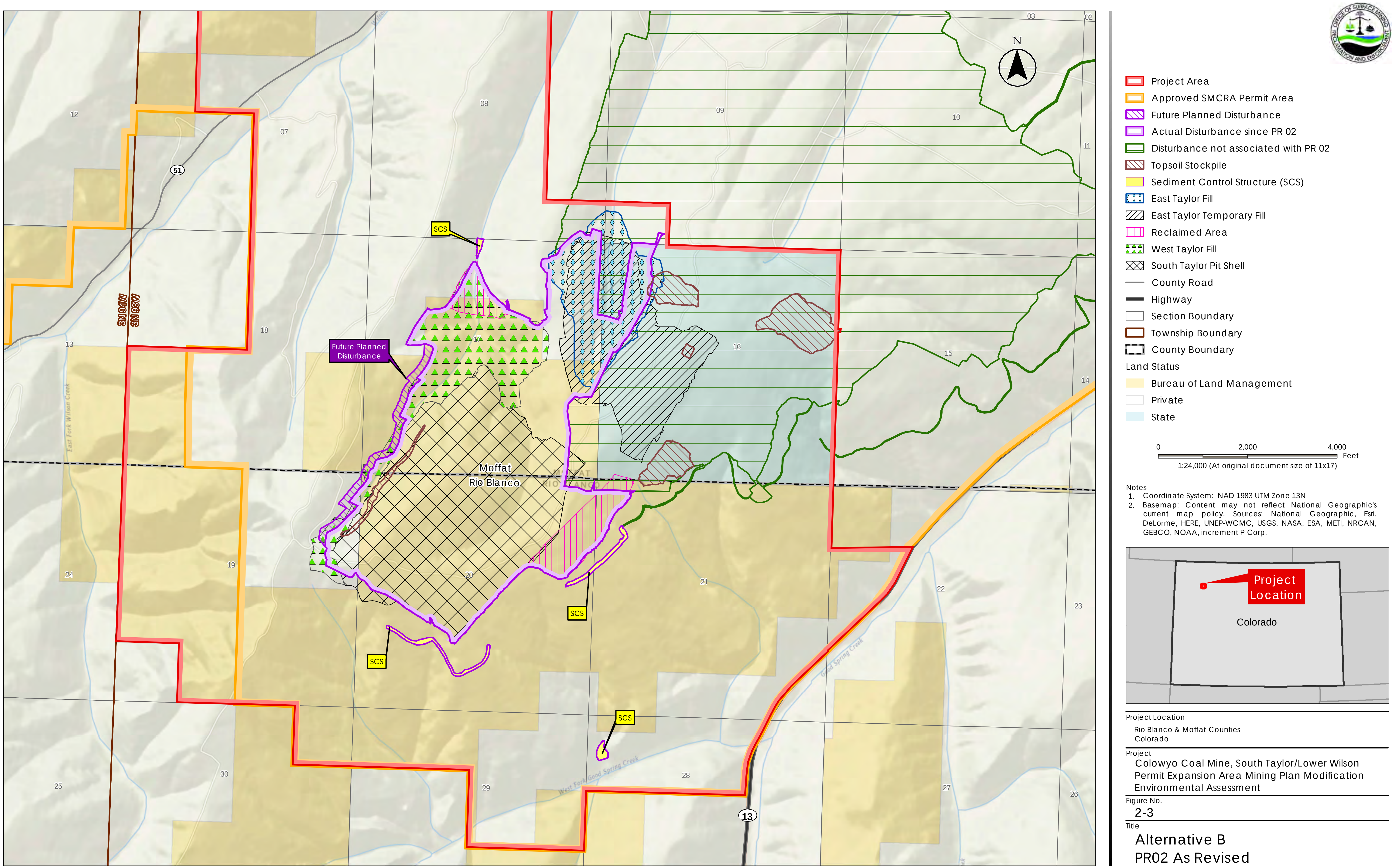
[1]Includes acreage from an area between the two permanent valley fills disturbed to support mining activities.

2.3.3 Mining Methods and Operation

Since 2008, the mining methods and operation have been the same as those described for Alternative A in **Section 2.2.2**, and are planned to continue in the same manner for the remainder of the mine life.

2.3.4 Project Design Features

As described in **Section 2.2.3**, the SMCRA permitting process under the State of Colorado's *approved regulatory program* requires applicants to incorporate design features into their mining proposals to protect or minimize impacts to a wide variety of environmental resources. Alternative B incorporates the design features included in Alternative A (**Table 2.2-1** and **Appendix B**), and additional features required as a result of approved minor revisions, technical revisions, midterm reviews, and permit renewals since 2008. A summary list of the more substantial additional design features incorporated in Alternative B (PR02 as Revised) is included in **Table 2.3-2** and a more detailed description of the design features incorporated in Alternative A is included in **Appendix B**.



Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
2-3

Title
Alternative B
PR02 As Revised

Table 2.3-2 Summary of Alternative B Additional Design Features

Resource Area	Measure
Fish and Wildlife	Establish sagebrush steppe to benefit Greater sage grouse (comprised of both core and ecotonal areas) on approximately 450 acres (minimum of 225 acres core) of the post-2008 reclamation for the original and South Taylor permit areas, or as otherwise agreed upon between Colowyo and CDRMS.
Threatened and Endangered Species	Revegetate for Greater sage grouse brooding habitat. Limit grazing to 60% to 80% of carrying capacity to provide for increased Greater sage grouse brood population.
Livestock Grazing	Limit grazing to 60% to 80% of carrying capacity.
Soils	Beginning with 2010 reclamation activities, institute a variable topsoil depth program to create distinct ecotonal habitats. Ridgelines and sideslopes received a variable depth to mimic natural deposition of soils and target a stable grassland ecotone (i.e. grazing areas). Flatter areas receive a constant topsoil depth to encourage sagebrush establishment to create sage grouse brood rearing habitat (i.e., sagebrush steppe areas)

2.4 Alternative C - No Action Alternative

The No Action Alternative, like Alternative B, reflects the surface disturbance and mining operations that have already occurred in the South Taylor/Lower Wilson Permit Expansion Area since 2007 as the result of subsequent revisions to PR02 approved by CDRMS. Under Alternative C, Colowyo has already disturbed approximately 789 acres *of previously undisturbed land* over the past 8 years. Of the 789 acres of *new disturbance that has already occurred, approximately 62 acres* have been reclaimed with regrading, topsoil, and reseeding. *However*, the proposed mining plan modification *as described under Alternative B above,* i.e., to continue *mining* operations, would not be approved. Colowyo would terminate the current mining operation in the South Taylor/Lower Wilson Permit Expansion Area in September 2015 following an orderly shutdown and would proceed immediately *to initiate* reclamation of *remaining un-reclaimed* lands disturbed by the South Taylor/Lower Wilson operation since 2007.

2.5 Alternatives Considered but Eliminated from Further Study

If an alternative is considered during the NEPA process, but the agency decides not to analyze the alternative in detail, the agency must identify those alternatives and briefly explain why those alternatives were eliminated from detailed study (40 CFR 1502.14). An action alternative may be eliminated from detailed study for a number of reasons, including:

- it is ineffective (does not respond to the purpose and need);
- it is technically or economically infeasible (consider 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 land use plan (LUP);
- its implementation is remote or speculative;
- it is substantially similar in design to an alternative that is analyzed; or,
- it would have substantially similar effects to an alternative that is analyzed.

2.5.1 Underground Mining Alternative

An alternative to require Colowyo to use underground mining methods to extract the coal was identified in public comments received during the outreach period, considered by OSMRE and eliminated from detailed study for the following reasons: CDRMS has approved a surface mining permit for this project using surface mining techniques; and underground mining is inconsistent with the approved permit. The Purpose and Need for this EA is predicated upon review of a surface mining plan included as part of the approved surface mining permit. An Underground Mining Alternative would, thus, be inconsistent with the Purpose and Need for this action.

Also, federal coal leases COC 29225 and COC 29226 are surface reserve leases only. These leases were sold by the federal government, purchased by the mining company, and held by the mining company, with the clear understanding by all parties concerned that these leases would be mined by surface mining methods only.

This alternative is also economically infeasible at current permitted production rates, and the economics of initiating an underground longwall mining operation in the South Taylor/Lower Wilson Expansion Area are not cost effective. The facilities and equipment needed for underground mining are different from surface mining. Because the infrastructure for underground mining is not in place at the Colowyo Mine, new infrastructure for underground mining would need to be constructed. The capital expenditure to develop an underground mine would be prohibitive. In addition, all new surface facilities would need to be constructed, including, but not limited to, conveyors, coal stock piles, a wash plant, and maintenance and support facilities. In addition, all new underground mining equipment would need to be purchased such as, but not limited to, a long wall mining system, conveyor systems/drives/power stations, vehicles for transporting men and supplies, several continuous miners, shuttle cars, large and small ventilation fans, and roof bolters.

In addition, approval by CDRMS of an application for a Permit Revision would be required to authorize underground mining. The process for Colowyo to design and engineer a new underground mine and for CDRMS to process a new permit application would take a number of years. The timeline for these processes would exceed the projected life of current surface mining at the South Taylor Pit and the revenue generation to allow investment in new infrastructure at the Colowyo Mine. These factors would also result in this being an economically unreasonable alternative to consider.

In summary, this alternative was not brought forward for analysis because underground mining does not respond to the Purpose and Need for this action and in addition, the economic burden to shift to underground mining would be prohibitive.

2.5.2 Air Quality Mitigation Alternatives

Some public comments suggested that OSMRE consider alternatives that mitigate air quality impacts, specifically by imposing more stringent emission limits at the Craig Generating Station and by requiring oil and gas operators in the region to reduce their emissions. These proposals are not alternatives to the mining operation. OSMRE has determined that, under NEPA, activities at the Craig Generating Station and nearby oil and gas operations are not dependent on the Proposed Action considered here and therefore do not meet the regulatory definition of a connected action (40 CFR 1508.25 (a) 1.) relative to any alternative carried forward, and do not fall within the scope of the Purpose and Need. However, the effects of coal combustion are analyzed in Alternatives A and B, as well as in the No Action Alternative because they are considered to be indirect effects. CEQ regulations at 40 CFR 1508 (b) define "indirect effects" as those which are caused by the proposed action and are later in time or farther removed in distance, but are still reasonably foreseeable. These indirect effects would occur as a result of burning the coal that is mined.

The Colowyo Mine is required to comply with the requirements of the Clean Air Act of 1970, as revised, and to obtain approval of an air quality permit from the CDPHE, under the requirements of the Colorado Air Pollution Prevention and Control Act that would incorporate measures that address the issues raised. Both Alternative A and Alternative B incorporate an Air Pollution Control Plan approved by CDRMS as part of the surface mining permit approval that incorporates design features committed to by Colowyo. As such, specific air quality mitigation under a separate and specific alternative would have substantially similar effects to that analyzed for Alternatives A and B.

2.5.3 Mining Plan with Reduced Disturbance Alternatives

As described above, PR02 was approved by CDRMS in 2007 and the mining plan modification for PR02 was initially approved by the ASLM (Alternative A). As a result of these approvals, mine operations were initiated in 2008, and mining has continued over the past seven years, subject to CDRMS approved revisions, which reduced the disturbance area (Alternative B). Alternatives that would consider a mining plan that is substantively different than what has already occurred between 2007 and the present would be technically infeasible and not consistent with the Purpose and Need and were not carried forward for analysis. We also considered alternatives that would reduce the disturbance area; however, we also did not carry these forward for analysis because those alternatives would be substantially similar in design and have substantially similar effects to Alternative B.

CHAPTER 3 AFFECTED ENVIRONMENT

3.1 GENERAL SETTING

The CEQ regulations state that NEPA documents "must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail" (40 CFR 1500.1(b)). While many issues may arise during scoping, not all of the issues raised warrant analysis in an EA. Issues will be analyzed if: 1) an analysis of the issue is necessary to make a reasoned choice between alternatives, or 2) if the issue is associated with a significant direct, indirect, or cumulative impacts, or where analysis is necessary to determine the significance of the impacts. ***Table 3.1-1*** *lists the resources considered and the determination as to whether they require additional analysis.*

Table 3.1-1 Resources and Determination of Need for Further Analysis

Determination[1]	*Resource*	*Rationale for Determination*
PI	*Topography*	*See discussion below.*
PI	*Air Quality*	*See discussion below.*
PI	*Greenhouse Gases*	*See discussion below.*
PI	*Geology and Minerals*	*See discussion below.*
PI	*Surface and Ground Water*	*See discussion below.*
PI	*Vegetation (includes invasive species and upland vegetation)*	*See discussion below.*
PI	*Wetlands and Riparian Zones*	*See discussion below.*
PI	*Fish and Wildlife Resources*	*See discussion below.*
PI	*Special Status Species (includes animal and plant species)*	*See discussion below.*
PI	*Cultural and Historic Resources*	*See discussion below.*
PI	*Indian Concerns*	*See discussion below.*
PI	*Socioeconomics*	*See discussion below.*
PI	*Environmental Justice*	*See discussion below.*
PI	*Visual Resources*	*See discussion below.*
PI	*Recreation*	*See discussion below.*
PI	*Paleontology*	*See discussion below.*
PI	*Access and*	*See discussion below.*

Determination[1]		
	Transportation	
PI	*Solid or Hazardous Waste*	*See discussion below.*
PI	*Noise*	*See discussion below.*
PI	*Livestock Grazing*	*See discussion below.*
PI	*Soils Resources*	*See discussion below.*
NP	*Prime Farmlands*	*See discussion below.*
NP	*Alluvial Valley Floors*	*See discussion below.*
PI	*Public Involvement*	*See discussion in Chapter 6.*
NP	*Wild Horses*	*No Herd Management Areas are located within or near the Project Area.*
NP	*Floodplains*	*No FEMA- designated floodplains are located within the Project Area.*
NI	*Wildfire Management*	*There would be no impact to fire management.*
NP	*Forest Management*	*No portion of the Project Area is managed for commercial timber operations.*
NP	*Areas of Critical Environmental Concern*	*No designated Areas of Critical Environmental Concern are located within or near the Project Area.*
NP	*Wild and Scenic Rivers*	*No Wild and Scenic Rivers are located within or near the Project Area.*
NI	*Realty Authorizations*	*All alternatives would have no impact to existing realty authorizations. There are no proposed changes to land tenure in the Project Area.*
NP	*Special Use Authorization*	*As the permit area is closed to the general public, no special use authorizations are available in the Project Area. Therefore, this will not be discussed further.*
NP	*Inventoried Roadless Areas*	*There are no inventoried roadless areas located within or near the Project Area.*
NP	*Wilderness Areas*	*There are no Wilderness Study Areas or lands that meet the criteria for wilderness characteristics located within or near the Project Area.*
NP	*Scenic Byways*	*There are no scenic byways located within or near the Project Area.*

[1] NP = Not present in the Project Area. NI = Present, but not affected to a degree that detailed analysis is required. PI = Present with the potential for impact analyzed in this EA.

The Project Area is located approximately 22 miles (35.4 km) north of Meeker, Colorado in Moffat and Rio Blanco counties (**Figure 1-1**). Nearby Moffat and Rio Blanco County communities include Maybell, Hamilton, Craig, and Meeker.

The climate is semi-arid shrub steppe with a mean annual precipitation of approximately 14 to 16 inches per year. The growing season is approximately 90 days. Prevailing winds are westerly. Vegetative communities in this landscape include sagebrush-perennial grass, and other shrub/woodland types such as oak brush, snowberry (*Symphoricarpos albus*), serviceberry (*Amelanchier* sp.), mountain mahogany (*Cercocarpus ledifolius*), pinyon-juniper, and aspen (*Populus tremuloides*). Vegetation cover ranges between 35 and 75 percent. Scattered aspen groves grow at the higher elevations and scattered juniper trees occur in the Project Area. Riparian vegetation occurs along the fringes of both Good Spring and Taylor Creeks and their tributaries (OSMRE 2001).

Figure 2-1 depicts the Affected Environment for the entire Project Area, which includes the entire South Taylor/Lower Wilson Permit Expansion, and is the area included in the analysis for each resource in this chapter. We note, however, that the actual disturbance area for the Project has been smaller than the Project Area. The actual and reasonably foreseeable future disturbance of the Project is shown on **Figures 2-3** (Alternative B) and **2-2** (Alternative A), respectively.

3.2 TOPOGRAPHY

The Project Area is located on the southern edge of the Yampa River Basin north of the Danforth Hills. The elevation ranges from approximately 8,660 feet above mean sea level (amsl) on the southern end of the Project Area to 6,620 feet on the north end. The area consists of gently sloping interfluvial ridges divided by deeply entrenched gulches and drainage valleys. Good Spring Creek to the east and Taylor Creek and Wilson Creek to the west are perennial streams. All of these drainages flow northeasterly to Milk Creek, a tributary of the Yampa River. Valley bottoms are generally narrow with very steep sides. Valley and gulch slopes are frequently 30 to 60 percent grade or steeper, but ridgetops are wide and gently sloping. The pre-mining topography is presented on Figure 18A in the approved PR02 (CDRMS 2007).

3.3 AIR AND CLIMATE RESOURCES

3.3.1 Airshed for Analysis

The regional airshed (approximately 4,000 square miles [12,360 km^2]) was defined using a topographic/airshed approach. An assessment was conducted to determine the reasonable airshed where regional impacts could occur. Boundaries were defined by topographic features. Meeker represents the southwest corner of the airshed. Heading northwest along Route 64, the western edge is defined by Sagebrush Draw, Elk Spring Ridge, and Cross Mountain. The northwest corner runs through Ninemile Basin just northwest of Godiva Rim. The boundary follows the Little Snake River northeast until approximately Shaffer's Draw. The northern boundary extends east across the Great Divide ridge, past State Highway 13 and the Elkhead Mountains. Sand Mountain represents the northeast corner of the air boundary and heads southeast to the town of Clark. The eastern edge is Steamboat Springs. The southeastern edge heads south through the town of Yampa and into Garfield County. Big Ridge and Oak Ridge, and back to Meeker, encompasses the southern boundary (**Figure 3-1**).

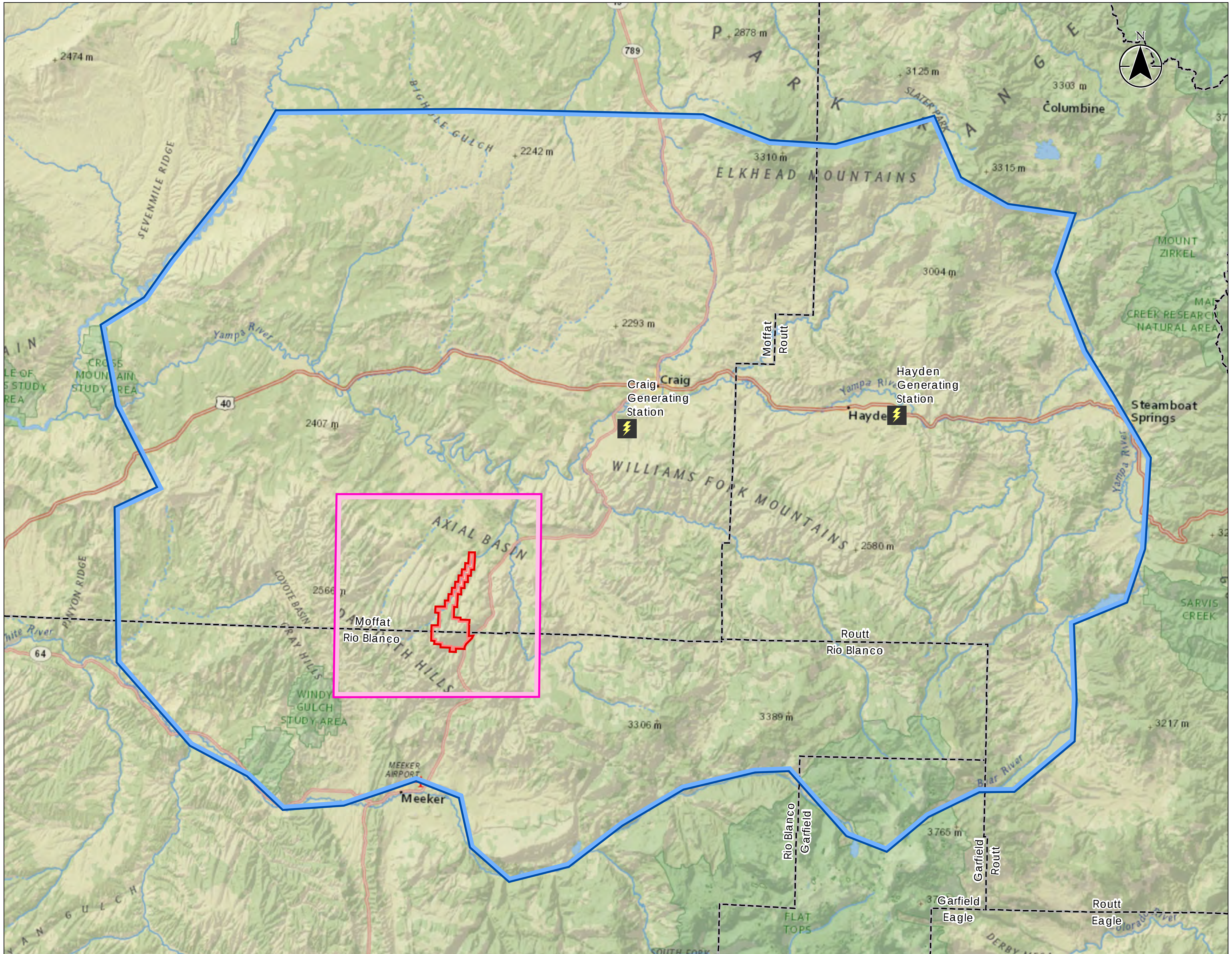
3.3.2 Regional Climate

The climate of the area is typical of a semi-arid, continental, mid-latitude region: warm summers and cold winters are characterized by high diurnal and seasonal temperature variations. The flow of Pacific air dominating the climate descends into the area as a warming and drying mass after depositing most of its moisture over the western slopes of the Sierra Nevada and Cascade Mountains. This generally creates a large rain shadow effect over Nevada, Utah, and western Colorado. Typically, severe storms and low pressure systems bypass the region by deflecting north or south over lower elevations of the Rocky Mountains in Wyoming and New Mexico. The predominant air mass over the Rocky Mountains during the winter is usually continental polar and produces cold, dry air during storm-free periods. High pressure systems that result in fine, light, powdery snow tend to become established in winter over the region which lies within the mean winter storm track. During the summer months, the air masses are generally maritime polar. This region is usually south of the main storm track in the summer; however, localized thundershowers do occur primarily during the afternoon, if a moisture supply is available either locally or in the air mass (BLM 2006).

3.3.3 Local Climate and Meteorology

Two onsite meteorological towers exist at the mine (**Figure 3-2**). The North Site was installed in 1997 and was brought back into service in 2008. The Gossard Site was installed in 2011. The North Site is approximately 3 miles (5 km) northeast of the center of the South Taylor Pit, at an elevation of 7,395 feet amsl, and the Gossard Site is located near the mine's rail load-out approximately 6 miles (10 km) north of the center of the South Taylor Pit at an elevation of 6,325 feet amsl. Each site collects data for temperature, relative humidity, wind speed and direction, barometric pressure and solar radiation. Data from these sites is provided to the CDPHE on a quarterly basis. Data for each site was reviewed from installation through the end of 2013 (**Appendix C**). The onsite data was also reviewed in the context of other regional meteorological monitoring sites at Craig and Meeker to develop a climatological summary of the region.

The data from Craig was collected at the Craig Airport (Station ID 24046). The station is located at 40.4930°, -107.5239° at approximately 6,191 feet amsl. The site records temperature, barometric pressure, relative humidity, precipitation, and wind speed and direction. The National Climate Data Center (NCDC) provides data for this site from September of 1996 through the present and the University of Utah's Mesowest provides data for this site since January of 1997 though the present (**Appendix C**).



Project Area

Air Quality Analysis Area

Regional Airshed Boundary

Generating Station

County Boundary

0 8 16 miles

1:506,880 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Project Location

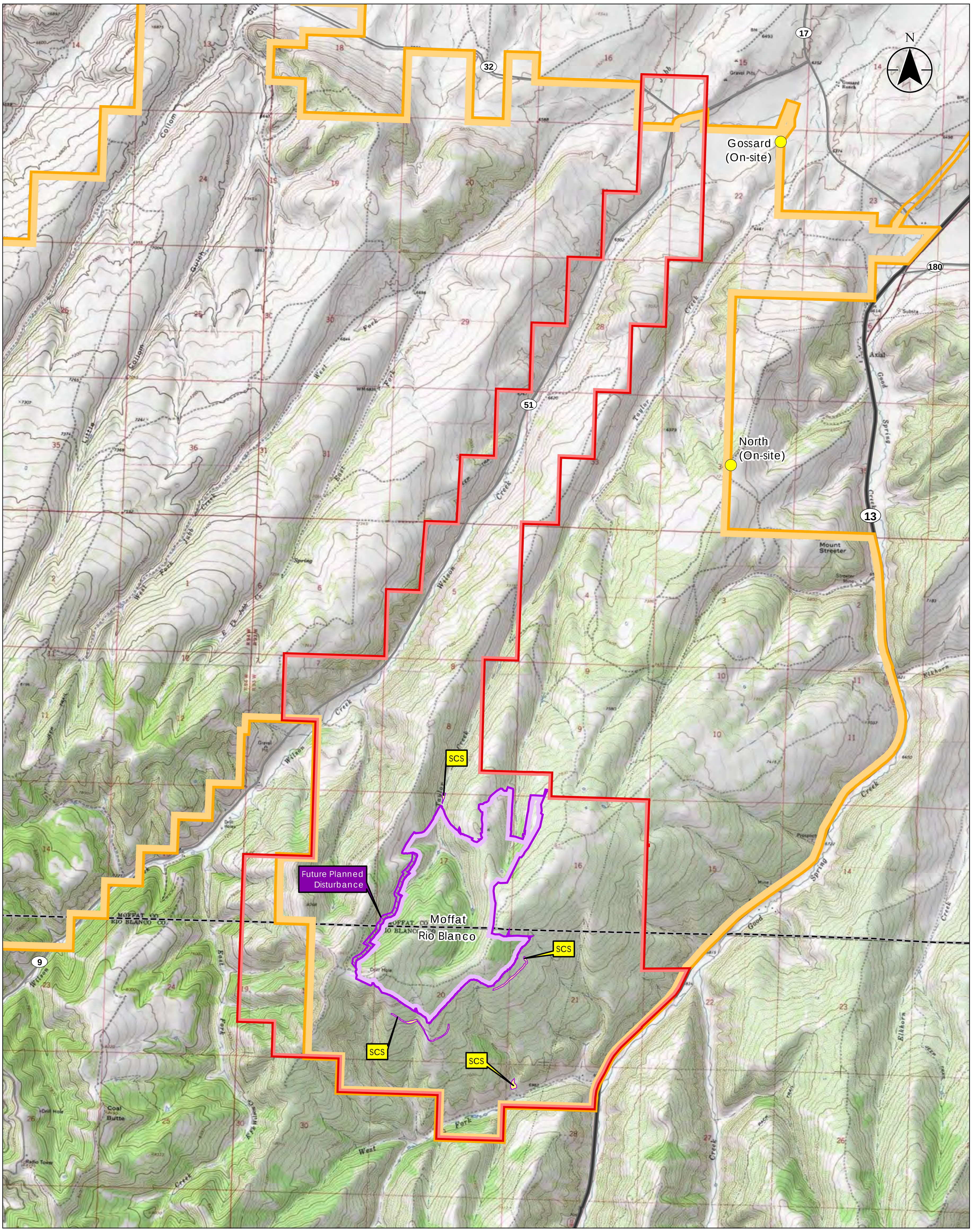
Colorado

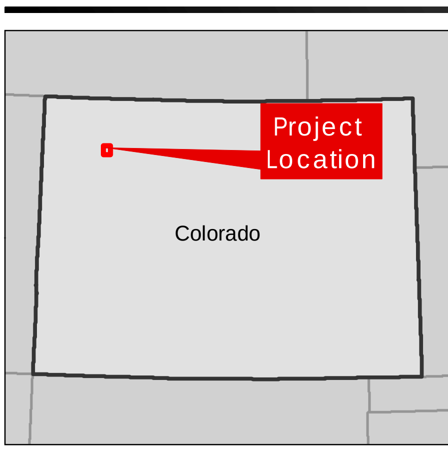
Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
3-1

Title
Air Quality Region





- Air Quality Monitoring Site
- Project Area
- Approved SMCRA Permit Area
- Future Planned Disturbance
- Actual Disturbance since PR 02
- Sediment Control Structure (SCS)
- County Road
- Highway
- County Boundary

0 4,000 8,000 Feet

1:48,000 (At Original document size of 11x17)

Notes
1: Coordinate System: NAD 1983 UTM Zone 13N
2: Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

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Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
3-2

Title
Onsite Meteorological Monitoring

The data from Meeker was collected at the Meeker Airport (Station ID 28801). The station is located at 40.0444° -107.8883° at approximately 6,365 amsl. The site records temperature, barometric pressure, relative humidity, precipitation and wind speed and direction. The NCDC provides data for this site from June 1, 1997 through the present and the University of Utah's Mesowest provides data for this site from April 1997 through the present (**Appendix C**).

The highest mean monthly temperatures occur in July, and range from 66.9 degrees Fahrenheit (°F) to 69.2 °F. The lowest mean monthly temperatures occur in January and range from 9.4 °F to 20.3 °F. Regional winds are affected by both synoptic events and orographic influences that cause wind patterns to predominately flow from southwest to northeast. Wind patterns atop the mountain ranges exhibit a stronger west to east flow pattern, while locally in the Project Area wind patterns are predominately from the west-southwest direction. The local topography also influences wind patterns; the Project Area terrain generally descends from south to north with some micro-scale terrain channeling of wind. The northern end of the Project Area runs along an east west axis to the south of the Yampa River Valley and the south end of the Project Area is characterized by higher mountainous terrain, with more complex topographic features. Wind speeds are generally more moderate in the daylight hours and lighter in the evening and night time hours. The mean monthly wind speeds ranged from 1.45 to 5.0m/s. Mean monthly wind speeds are generally lowest in January and highest during the four month period of March through June.

Regional precipitation averages approximately 1.25 inches per month with the highest monthly precipitation totals occurring during the spring and fall. Annual precipitation amounts averaged from 2005 to 2013 were 13.8 inches in Craig and 16.2 inches in Meeker.

3.3.4 Regulatory Requirements

The regulatory framework for air quality includes both federal and state rules, regulations, and standards promulgated by the EPA and implemented by the CDPHE. The Clean Air Act (CAA) established the NAAQS for seven criteria pollutants. The criteria pollutants include carbon monoxide (CO), lead, nitrogen dioxide (NO_2), ozone, particulate matter 10 microns (PM_{10}) or less in diameter, particulate matter 2.5 microns ($PM_{2.5}$) or less in diameter, and sulfur dioxide (SO_2) (**Table 3.3-1**).

Pursuant to the CAA, the EPA has developed classifications for distinct geographical regions known as Air Quality Control Regions (AQCR). In Colorado, the state has been divided into eight multi-county areas that are generally based on topography and have similar airshed characteristics. The Project Area airshed analysis area (**Section 3.3.1**) lies in the Western Slope Air Pollution Control Region as designated by the State of Colorado. The EPA designates whole or partial counties as Attainment, Non-Attainment, or Maintenance for each criteria air pollutant. Regions classified as in Attainment, are areas in which the pollutant has not exceeded the NAAQS. A Non-Attainment classification represents an area in which the pollutant has exceeded the NAAQS. The Maintenance designation is used when monitored pollutants have been reduced from the Non-Attainment to the Attainment levels. Moffat County has been designated as Attainment for all criteria pollutants based on monitoring results that were below the applicable NAAQS.

Table 3.3-1 National Ambient Air Quality Standards

Pollutant		Averaging Time	National Standard	Form
Carbon Monoxide (CO)		8-hour	9 ppm	Not to be exceeded more than once a year
		1-hour	35ppm	
Lead		Rolling 3 month average	0.15 $\mu g/m^3$	Not to be exceeded
Nitrogen Dioxide (NO_2)		1-hour	100 ppb	98th percentile, averaged over 3 years
		Annual	53 ppb	Annual Mean
Ozone		8-hour	0.075 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution	$PM_{2.5}$	Annual	12 $\mu g/m^3$	Annual mean, averaged over 3 years
		24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM_{10}	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		3-hour	0.5 ppm	Not to be exceeded more than once per year
		3-hour	700 $\mu g/m^3$	Not to be exceeded more than once in any twelve month period

Source: http://www.epa.gov/air/criteria.html as of October, 2011
$\mu g/m^3$ = micrograms per cubic meter of air
ppm = parts per million, ppb = parts per billion
State standard established by the Colorado Air Quality Control Commission

The CAA also divides areas where air quality is already cleaner than required by federal standards into three classes, and specifies the increments of SO_2, NO_2 and particulate pollution allowed in each class as regulated by the Prevention of Significant Deterioration (PSD) regulations (40 CFR 52.21). Class I areas include international and national parks, wilderness and other pristine areas; allowable increments of new pollution in these areas are very small. Class II areas include all attainment and not classifiable areas, which are not designated as Class I; allowable increments of new pollution in these areas are modest. Class III represents selected areas that states may designate for development; allowable increments of new pollution are large (but not exceeding NAAQS); no Class III areas are designated in Colorado. All areas not designated as Class I are initially designated as Class II areas. The Project Area is located in a Class II area as codified in the Colorado State PSD permitting rules[1]. The PSD regulations are applicable to a source pollutant if the source has the potential to exceed the major source thresholds, of either 100 or 250 tons per year (tpy) of a regulated New Source Review pollutant, depending on the type of source pollutant that it is. For stationary source categories listed in the regulation, the threshold is 100 tpy. For source categories that are not listed, such as surface mining operations, the threshold is 250 tpy. The potential to emit calculation does not include fugitive emissions for the purpose of determining if the facility exceeds the 250 tpy threshold. Fugitive emissions are defined by EPA as, "those emissions that could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening". The Project is classified under the CAA as a minor source of air quality emissions

[1] 5 CCR 1001-05, Regulation Number 3, Part D, Concerning Major Stationary Source New Source Review and Prevention of Significant Deterioration

and would not exceed these thresholds under the PSD regulations because the majority of the project emissions sources are fugitive in nature and as such are not included in the determination of PSD applicability for a non-listed source category such as coal mining. Therefore, PSD regulations and preconstruction monitoring would not be applicable to the mine. It should be noted that minor sources while not subject to PSD regulations can affect increments, but emissions remain below increment thresholds.

Stationary sources in the vicinity of the Project Area that are regulated under PSD include the Craig Generating Station and the Hayden Generating Station outside of Craig and Hayden, Colorado respectively.

Federal PSD regulations limit the maximum allowable increase in ambient pollutant concentration in Class I, Class II, and Class III areas (**Table 3.3-2**). The nearest Class I areas to the Project Area are the Flat Top Wilderness, 22 miles (35 km) southeast; Mount Zirkel Wilderness, 50 miles (80 km) northeast; and the Maroon Bells-Snowmass Wilderness and Eagle's Nest Wilderness, 62 miles(100 km) south/southeast and southeast, respectively (**Figure 3-3**). It should also be noted that Class II areas such as Dinosaur National Monument and Colorado National Monument are treated as Class I areas with regard to SO_2 concentrations.

Table 3.3-2 Federal Prevention of Significant Deterioration Limits

Pollutant	Averaging Time	Maximum Allowable Increase (μg/m^3)		
		Class I Area	Class II Area	Class III Area
$PM_{2.5}$	Annual	1	4	8
	24-hour	2	9	18
PM_{10}	Annual	4	17	34
	24-hour	8	30	60
SO_2	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
NO_2	Annual	2.5	25	50

μg/m^3 = Micrograms Per Cubic Meter of Air

The CAA also enacted the New Source Performance Standards (NSPS) and National Emissions Standards for Hazardous Air Pollutants (NESHAP) for specific types of equipment located at new or modified stationary pollutant sources. NSPS regulations limit emissions from source categories to minimize the deterioration of air quality. Stationary sources are required to meet these limits by installing newer equipment or adding pollution controls to older equipment that reduce emissions below the specified limit. The Project Area would include equipment that is subject to various NSPS and NESHAP regulations. NSPS and NESHAP standards also apply to the locations of final coal combustion.

The CAA Amendments of 1990 introduced a new facility-wide Federal Operating Permit program. Federal Operating Permits, also known as Title V permits, are required for facilities with the potential to emit more than 100 tpy of a regulated pollutant, 10 tpy of any single hazardous air pollutant (HAP), or 25 tpy of any combination of HAPs and considered to be major sources of air quality emissions. No NAAQS exist for HAPs; instead emissions of these pollutants are regulated by a variety of laws (e.g., NESHAPs) that target the specific source class and industrial sectors for stationary, mobile, and product use/formulations. However, Title V permitting is still required if HAP emissions rise above the defined thresholds.

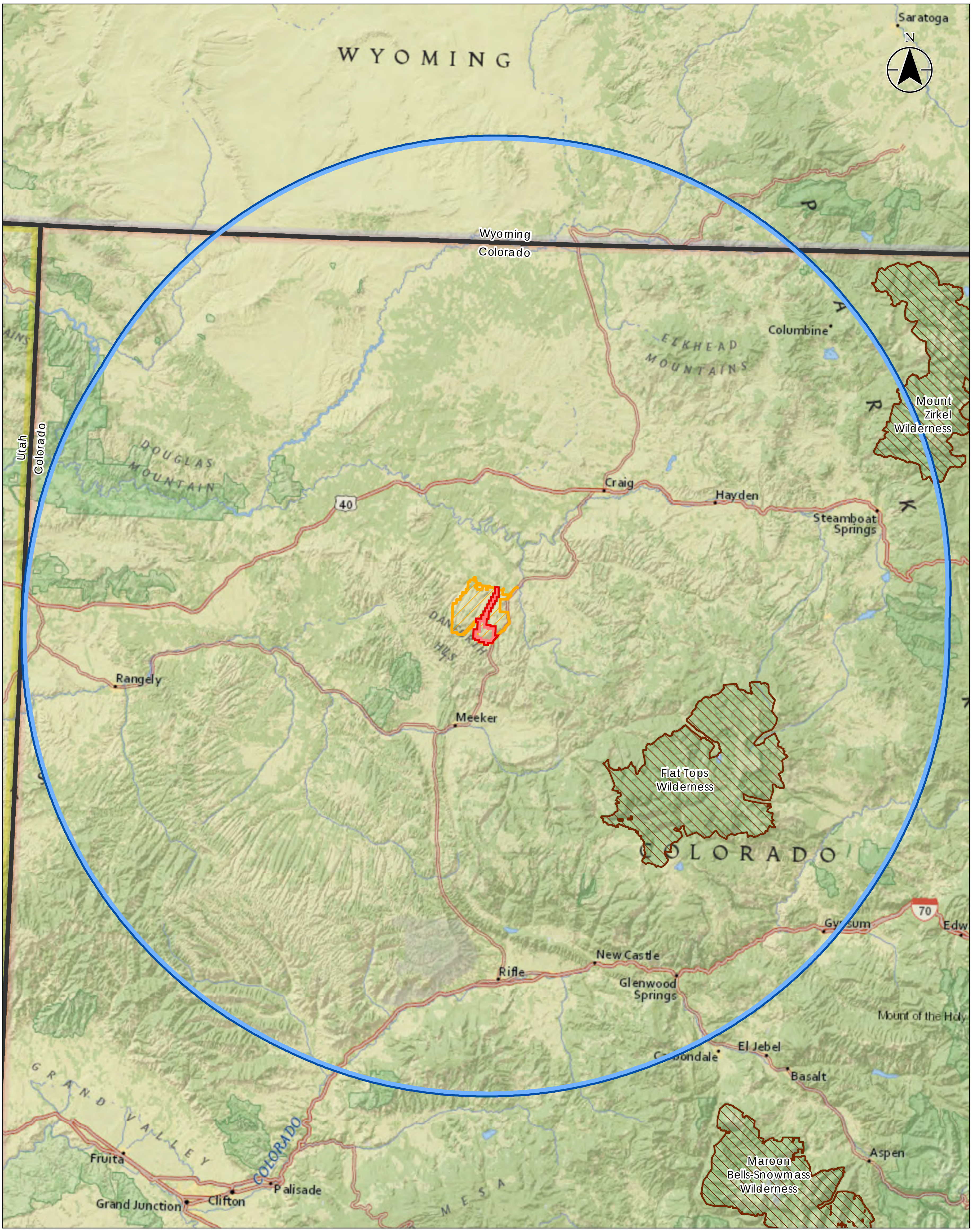
The mine's potential to emit is below the requirements to obtain a Federal Operating Permit and, therefore, it would not be subject to Title V permitting. Title V operating permit requirements are typically applicable for the locations of final coal combustion. Both the Craig and Hayden Generating Stations have Title V permit applicability.

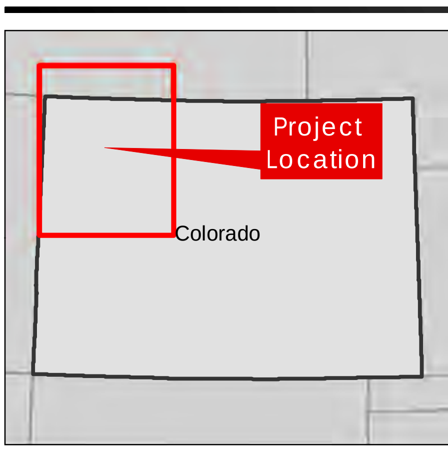
In addition to the permitting of criteria and HAPs regulations exist for the control of mercury and air toxics, acid deposition, visibility impacts, and regional haze.

The final location of coal combustion is often regulated under numerous environmental regulations. Until 2011, the Craig Generating Station and other generating facilities had no federal standards that required them to limit their emissions of toxic air pollutants like mercury, arsenic and metals. On December 16, 2011, the EPA finalized the first national standards to reduce mercury and other toxic air pollution from coal and oil-fired power plants. These rules set technology-based emissions limitation standards for mercury and other toxic air pollutants, reflecting levels achieved by the best-performing sources currently in operation. The final rule sets standards for all HAPs emitted by coal- and oil-fired electric generating units (EGUs) with a capacity of 25 megawatts or greater. All regulated EGUs are considered major under the final rule. EPA did not identify any size, design, or engineering distinction between major and area sources. Existing sources generally have up to four years if they need it to comply with the Mercury and Air Toxics Standards (MATS)[2].

The emissions limits associated with the MATS rule are presented in **Table 3.3-3**. The Craig Generating Station has attained compliance with MATS for Units 1 and 2 at the facility and Unit 3 will attain compliance by the end of 2015. The Hayden Generating Station complies with a more stringent Colorado state-only regulation (Colorado Regulation No. 6, Part B, Section VIII.B.10) where each unit is considered a Low Emitter, emitting no more than 29 lb of mercury per year.

[2] The Supreme Court recently held that the EPA did not properly consider the costs of the MATS rule. See *Michigan v. EPA*, ___ U.S. ___, 192 L. Ed. 2d 674 (June 29, 2015). The consequences of this decision are still being assessed by EPA and the lower courts. For purposes of this EA, the analysis includes the MATS rule in effect because the primary emitters have already complied with those standards.





- Project Area
- Project Area 100-km Buffer
- Approved SMCRA Permit Area
- USFS Class I Area
- State Boundary

0 14 28 Miles

1:887,040 (At Original document size of 11x17)

Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
3-3

Title
Class I Areas

Notes
1: Coordinate System: NAD 1983 UTM Zone 13N
2: Service Layer Credits: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Table 3.3-3 MATS Emission Requirements

Coal and Oil Fired Units		Subcategory	Mercury Emission Limit (lb./GWh)
	Existing	Regular Coal	0.013
		Designed for Low Rank Coal[1]	0.12 or 0.040
		IGCC (Gasified Coal)	0.03
		Solid-oil Derived & Continental Liquid Oil	0.002
		Non-continental Liquid Oil	0.004
	New	Regular Coal	0.0002
		Designed for Low Rank Coal	0.04
		IGCC (Gasified Coal)	0.003
		Solid-oil Derived	0.002
		Continental Liquid Oil	0.0001
		Non-continental Liquid Oil	0.0004

Source: EPA MATS final rule, pp. 347-351, http://www.epa.gov/mats/pdfs/20111216MATSfinal.pdf
lb./GWh = pounds of pollutant per gigawatt – electric output
[1] Most of these units burn lignite coal

The PSD regulations described previously also regulate the degradation of Air Quality Related Values (AQRV) in Class I areas. The authority to protect AQRVs in federally mandated Class I areas is to be done as part of the preconstruction permitting process of major sources. AQRVs include all resources sensitive to changes in air quality and typically include visibility degradation, pollutant deposition on vegetation and water bodies, and acidification of sensitive water bodies. AQRV impact review during permitting is applicable to both the Craig and Hayden Generating Stations.

In addition to PSD AQRV analyses, visibility impacts are also included under a State Implementation Plan (SIP) for the reduction of Regional Haze. This regulation is used to reduce the visibility impacts from existing facilities and introduce additional emissions controls to a standard known as Best Available Retrofit Technology (BART).

The Craig Generating Station has three units that are BART eligible. Units 1 and 2 are included in the current Regional Haze SIP. As a result, both are required to include Selective Catalytic Reduction (SCR) to control NOx emissions. They are also required to have a wet lime scrubber for SO_2 control. According to modeling prepared as part of the BART analysis, NO_x controls will improve visibility by 1.01 deciview (dv; a unit of visibility impairment) for Unit 1 and 0.98 dv for Unit 2. Unit 3 is considered to be eligible for "Reasonable Progress"[3]. The Colorado SIP includes a determination for Unit 3 stating that it is reasonable to include a Selective Non-Catalytic Reduction (SNCR) for NOx, which will improve visibility by 0.32 dv.

[3] CDPHE Regional Haze SIP Craig Station https://www.colorado.gov/pacific/sites/default/files/AP_PO_Craig-Power-Plant_0.pdf

Similarly, the Hayden Generating Station has two units identified as BART eligible in the SIP. Both are using lime spray dryers to control SO_2. Unit 1 improves visibility by 0.10 dv and Unit 2 by 0.21 dv. Hayden also controls NO_x using SCR. Visibility improvements are estimated at 1.12 dv and 0.85 dv for Units 1 and 2, respectively.

The controls being implemented by the two power stations are helping to greatly improve the visibility in the region surrounding the Mount Zirkel Wilderness. In addition, the U.S. Forest Service has stated that their concerns regarding visibility (originally noted in a letter to the State in 1993) within the wilderness have been resolved. The State of Colorado is also in agreement that control measures taken by the two facilities are sufficient in resolving the U.S. Forest Service concerns.

3.3.5 Regional Air Quality

The Project Area and vicinity is currently in Attainment or unclassified for all criteria pollutants. Monitoring of criteria pollutants in the region is located near population centers or areas of specific interest. In the late 1990s the EPA allowed monitoring to cease where pollutants were less than 60 percent of the NAAQS, and as a result the data collected for this analysis is regionally representative but often monitored at some distance from the Project.

PM_{10} data from two monitoring locations, one in Steamboat Springs, 74 miles (119 km) east-northeast of the Project Area, and one in Parachute, 87 miles (140 km) south of the Project Area, were reviewed for 2014 (**Figure 3-4**). Data from 2014 are also available for Rifle and Grand Junction. The highest 24-hr concentration for Parachute was 39 micrograms per cubic meter of air ($\mu g/m^3$) and the highest 24-hr concentration for Steamboat was 84 $\mu g/m^3$. Both values were below the NAAQS (150 $\mu g/m^3$) (**Table 3.3-4**).

3.3.5.1 NO_2

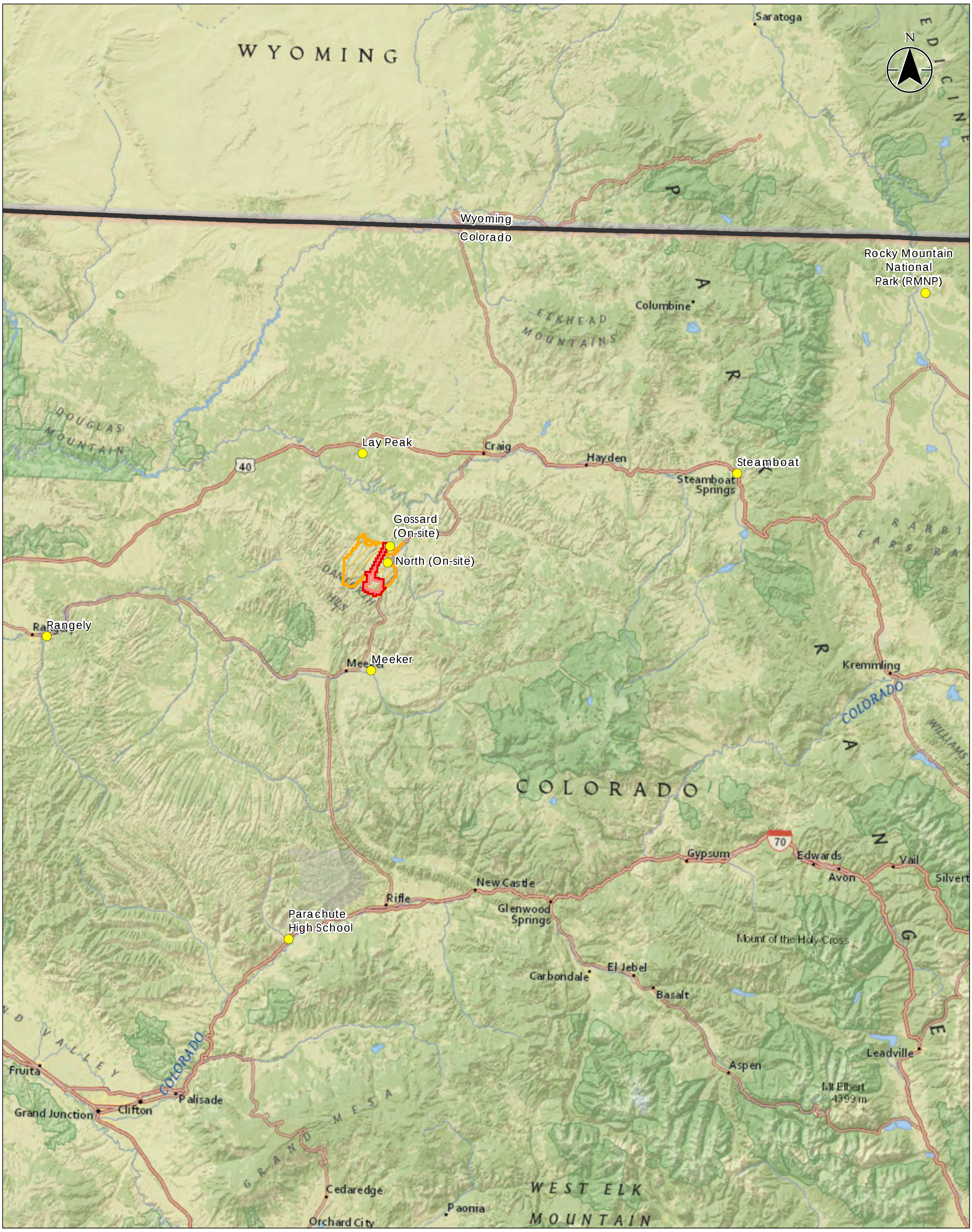
The nearest representative NO_2 data is collected at the USDA Upper Colorado Environmental Plant Center in Meeker, 16 miles (25 km) south of the Project Area. The highest hourly background at the site during 2014 was 6.1 parts per billion (ppb) which is below the NAAQS (100 ppb).

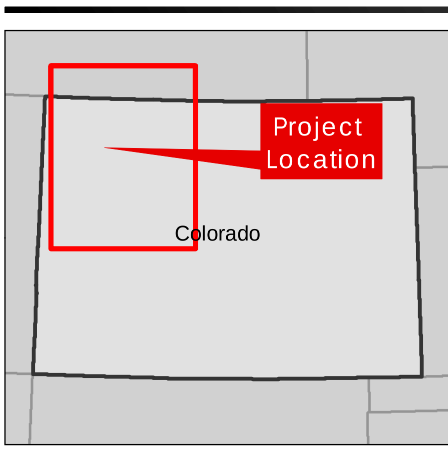
3.3.5.2 $PM_{2.5}$

The nearest representative $PM_{2.5}$ data is collected in Rangely, 53 miles (85 km) west of the Project Area. The highest 24-hr concentration background at the site during 2014 was 17.8$\mu g/m^3$ which is below the NAAQS (35 $\mu g/m^3$).

3.3.5.3 Ozone

The nearest representative ozone data is collected at Lay Peak (27 km northwest of the Project Area). The highest 8-hr background at the site during 2014 was 0.067 parts per million (ppm) which is below the NAAQS (0.075 ppm).





- Air Quality Monitoring Site
- Project Area
- Approved SMCRA Permit Area
- State Boundary

0 14 28 Miles

1:960,324 (At Original document size of 11x17)

Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
3-4

Title
Regional Air Quality Monitoring

Notes
1: Coordinate System: NAD 1983 UTM Zone 13N
2: Service Layer Credits: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Table 3.3-4 Regional Air Quality Monitoring Conditions

Monitor	Location	Active Since	Monitoring Agency	Annual Samples	Elevation (ft.)	1-hr	3-hr	8-hr	24-hr
PM_{10} (μg/m3)									
Rifle	*51 mi* (82 km) south in Rifle, CO	2005	CDPHE	120					47
Grand Junction	*93 mi* (148 km) southwest in Grand Junction , CO	2004	CDPHE	118					46
Parachute High School	*88 mi* (140 km) southwest in Parachute, CO	2001	CDPHE	119	5,100				39
Steamboat	*56 mi* (89 km) northeast in Steamboat, CO	1987	CDPHE	346	7,400				84
Colowyo Onsite	Colowyo Existing Facility	Detailed discussion in Section 3.3.7"On-site Air Quality"			7,100	Detailed discussion in Section 3.3.7"On-site Air Quality"			
NO_2 (ppb)									
Rangely	*51 mi* (82 km) southwest near Rangely, CO	2011	National Park Service	8592		19.6			
Meeker	*18 mi* (28 km) south in Meeker, CO	2011	National Park Service	8584	6,500	6.1			
SO_2 (ppb)									
Walden - Colorado, Chandler Ranch	*91 mi* (145 km) northeast, north of the Project Area	2012	National Park Service	4452	7,930	1			0.5
CO (ppm)									
Walden - Colorado, Chandler Ranch	*91 mi* (145 km) northeast, north of the Project Area	2013	National Park Service	4330	7,930	0.3		0.3	

Monitor	Location	Active Since	Monitoring Agency	Annual Samples	Elevation (ft.)	1-hr	3-hr	8-hr	24-hr
$PM_{2.5}$ (µg/m3)									
Grand Junction	*93 mi* (148 km) southwest in Grand Junction, CO	2003	CDPHE	363					29.3
Rangely	*51 mi* (82 km) west in Rangely, CO	2011	National Park Service	325	5,500				17.8
Ozone (ppm)									
Rifle	*51 mi* (82 km) south near Rifle, CO	2009	CDPHE	192 days out of 214 required				0.062	
Palisade	*83 mi* (132 km) southwest near Palisade, CO	2009	CDPHE	212 days out of 214 required				0.064	
Meeker	*17 mi* (27 km) southwest in Meeker, CO	2010	National Park Service	206 days out of 214 required				0.063	
Rangely	*51 mi* (82 km) southwest near Rangely, CO	2011	National Park Service	203 days out of 214 required				0.066	
Lay Peak	*17 mi* (27 km) northwest, *west* of Craig, CO	2012	CDPHE	6516	6,250			0.067	

µg/m³ = micrograms per cubic meter of air; ppm = parts per million; ppb = parts per billion

3.3.5.4 SO_2 and CO

The Williams Willow Creek station, which monitors both SO_2 and CO, is within 38 miles (61 km) of the Project Area. SO2 and CO measured concentrations of 1.0 ppb in 2012 for all averaging periods of interest. Both SO_2 and CO are highly affected by local sources of combustion and are typically low in the rural Project Area. For similar mining projects in the western U.S.[4], backgrounds of zero have been used when no monitoring data exists. The nearest rural monitoring station for SO_2 and CO exists at the Chandler Ranch in Walden, Colorado, 90 miles (145 km) from the Project Area. For 2014, the highest SO_2 1-hr, 3-hr and 24-hr backgrounds at the site were 1.0, 0.5 and 0.3 ppb, respectively. The highest 1-hr and 8-hr CO backgrounds were 0.25 and 0.3 ppb, respectively. Both SO_2 and CO are below the NAAQS.

3.3.6 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 (e.g., factories, refineries, power plants) and mobile sources (e.g., cars, trucks, buses), as well as indoor sources (building materials and cleaning solvents). The majority of HAPs emitted from the Project would be the result of vehicle use. The major source threshold for HAPs is 10 tpy of any one HAP or 25 tpy of aggregate HAPs. The Colowyo Mine would not be categorized as a major source for HAPs because the mine produces approximately 2 tpy of total HAPs.

3.3.7 Onsite Air Quality

The North and Gossard air monitoring stations are equipped with Rupprecht & Patashnick Model 1400a continuous PM_{10} samplers and R.M. Young AQ Model 05305 prop-vane anemometers. The station locations were selected with direction and approval from the Colorado Air Pollution Control Division (APCD), and were designed to monitor the maximum PM_{10} impacts at the Colowyo Mine property line. The monitoring stations are operated according to separate Quality Assurance Project Plans (QAPPs) for the meteorological and the PM_{10} measurements. The EPA requirements for format and content have been followed in each QAPP and each has been approved by the APCD.

The monitors provide hourly and daily PM_{10} concentrations. A summary of each monitor's high concentration events is provided below and in **Table 3.3-5**.

- North Site: July 29, 2008 through present. There have been 12 high concentration PM_{10} events recorded during this period.
- Gossard: July 17, 2011 through present. There has been one high concentration PM_{10} event recorded during this period.

[4] Draft EIS for the Gold Rock Mine Project Volume 2 BLM/NV/EL/ES/15-05+1793 February, 2015

Note that for comparisons of PM_{10} data to the NAAQS, the resulting concentration must be greater than 155 µg/m^3 in order to be considered an exceedance. The PM_{10} NAAQS is a probabilistic standard and is defined as a level not to be exceeded more than once per year and is averaged over a three year period. As such, an exceedance of the daily value does not directly equate to an exceedance of the standard (or a non-attainment determination).

Table 3.3-5 Colowyo Mine Network High PM_{10} Concentration Events

Event	Number Date	North Site Daily Value of PM_{10}, µg/m^3	Gossard Daily Value of PM_{10}, µg/m^3	Calendar Quarter
1	11/02/08	298	-	4
2	03/04/09	237	-	1
3	03/22/09	167	-	1
4	07/06/09	157	-	3
5	09/29/09	291	-	3
6	09/30/09	180	-	3
7	12/04/09	193	-	4
8	05/28/10	198	-	2
9	01/14/12	156	-	1
10	05/26/12	200	178	2
11	01/29/14	174	-	1
12	01/05/15	186	-	1

The monitoring of high concentration PM_{10} (**Table 3-3.5)** was addressed by CDPHE. The result was the development of a Colowyo Mine PM_{10} mitigation plan and modeling report (Colowyo 2010a). The report addressed Events 1-8 and identified that the PM_{10} sources for these events were: 1) an active coal pile (identified as 'R3') located close to the property boundary, 2) a parking area, 3) a maintenance area, and 4) an area referred to as the 'boneyard' that is used to store old vehicles and salvageable materials. The report demonstrated that the boneyard and R3 coal pile contributed 64 percent and 14 percent, respectively, of the PM_{10} source impact. Since the time of that report an updated Colowyo Mine Air Quality Mitigation Plan (Colowyo 2010a) called for the following: 1) increased dust controls at the boneyard, and 2) the relocation of the R3 coal pile to a previously mined area that is below the level of the surrounding terrain. In October 2012, the R3 coal stockpile was relocated and the area was reclaimed and vegetated as a further dust mitigation measure. The mitigation strategy has significantly reduced monitored impacts.

The final three daily value exceedances, found in high concentration PM_{10} events (**Table 3-3.5**), occurred in 2012 and 2014. Events 9 and 10 are potentially associated with natural or exceptional high wind events (Colowyo 2013b, Colowyo 2013c, and Colowyo 2013d). The January 29, 2014 event (Event 11) is currently being evaluated; site data indicates this event also qualifies as a natural or exceptional event. These reports detail the classification of a high concentration PM_{10} event as an event that should not be included in compliance determinations, due to its classification as natural or exceptional, based on EPA guidelines for such events. This conclusion is supported by regional meteorological and air quality data from the event periods.

3.3.8 Existing Air Pollutant Emission Sources

There are a total of 163 permitted air quality emission sources that are currently located within 31 miles (50 km) of the Project Area. The region is generally rural and the emissions sources are dominated by mining, power generation, oil and gas production, and aggregate (sand and gravel) processing (CDPHE 2015a) (**Appendix C**). CDPHE (2015a) includes in its permits all sources of air quality emissions that are required by law to acquire a state air quality permit. Sources such as dust from dirt roads, agricultural operations, recreational activities and automobile use are not included because they are not regulated as stationary industrial sources but have the capacity to produce air quality emissions regionally.

3.3.9 Existing Coal Combustion Environment

Two existing coal fired electrical generating facilities are currently operating in the vicinity of the Project Area. The Craig Generating Station is located 4 miles (6 km) southwest of Craig, and twenty miles (32 km) northeast of the center of the Project Area. The Craig Generating Station is operated by Tri-State. It consists of three coal fired steam driven electric generating units (Units 1, 2, and 3). Total net electric generating capacity is 1,264 MW. The Hayden Generating Station, owned and operated by the Public Service Company of Colorado, is located 4 miles (6 km) east of Hayden, and 39 miles (63 km) northeast of the center of the Project Area. It consists of two coal fired steam driven electric generating units (Units 1 and 2). Unit 1 is rated at 205 MW and Unit 2 is rated at 300 MW. Both facilities receive their coal from a variety of sources. Each facility operates under a PSD major source permit issued by CDPHE.

CDPHE requires the submission of actual emissions data for each facility on an annual basis (**Table 3.3-6**).

Table 3.3-6 Regional Coal Fired Generating 2014 CDPHE Reported Actual Emissions Summary[5]

Location	2014 APENs Annual Actual Pollutant Emissions (tpy)						
	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC[1]	HAPS
Craig Generating Station	172.2	121.1	1232.8	12091.0	3261.0	62.2	52.26
Hayden Generating Station	148.3	67.5	385.1	6483.6	2330.7	49.2	15.08

[1] volatile organic compound

Colowyo has historically provided coal to a variety of end users, both regionally and nationally. Since 1977, the beginning of coal sales records, Colowyo has provided coal to approximately ninety different end users all over the nation (**Appendix C**). In recent years, 2007 to present, Colowyo has sold between 41 percent and 99 percent of their coal to the Craig Generating Station. The average annual sales to the Craig Generating Station between 2007 and 2014 were 2.3 million tpy. This represents approximately 48 percent of the coal required for the Craig Generating Station's annual coal needs.

[5] CDPHE APENS Reporting for 2014, provided electronically by CDPHE.

Colowyo has provided the Hayden Generating Station with coal in the past but only in small amounts ranging from below 100 tpy to a maximum of approximately 500 tpy. Colowyo has not provided any coal to the Hayden Generating Station since 2005.

The trend towards supplying coal exclusively to the Craig Generating Station seen from 2007 to present is a deviation from historical coal sales within which Colowyo sold coal to a much wider array of end users. The coal distribution may become more consistent with the longer historical sales record as the Colowyo Mine continues to pursue additional clients,

3.3.10 Climate Change

The primary natural and synthetic GHGs in the Earth's atmosphere are water vapor, carbon dioxide (CO_2), methane, nitrous oxide, and fluorinated gases. GHGs allow heat from the sun to pass though the upper atmosphere and warm the earth by blocking some of the heat that is radiated from the earth back into space. As GHG concentrations increase in our atmosphere they impact the global climate by further decreasing the amount of heat that is allowed to escape back into space. Many GHGs are naturally occurring in the environment; however, human activity has contributed to increased concentrations of these gases in the atmosphere. Carbon dioxide is emitted from the combustion of fossil fuels (i.e., 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 results from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills. Methane is also emitted during the production and transport of coal, natural gas, and oil. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Fluorinated gases, while not abundant in the atmosphere, are powerful GHGs that are emitted from a variety of industrial processes and are often used as substitutes for ozone-depleting substances (e.g., chlorofluorocarbons, hydrochloroflourocarbons, and halons).

The EPA tracks GHG emissions in the U.S. by source sector (e.g., industrial, land use, electricity generation, etc.), fuel source (e.g., coal, natural gas, geothermal, petroleum, etc.), and economic sector (e.g., residential, transportation, commercial, agriculture, etc.) (**Table 3.3-7**). With so many GHG emission sources nationally, from cattle to vehicles to electric power generators, no single source is likely to represent a significant percentage of national emissions. Nevertheless, GHG emissions for the U.S. are provided here in several ways. **Table 3.3-7** shows GHG emissions (in CO_2 equivalent [CO_2e]) by economic sectors for 1995, 2000, and 2007. **Table 3.3-8** shows total U.S. emissions in 1995, 2000, and 2007 by gas and source and by CO_2e; only the largest sources/sinks are shown for each gas. Note that, for CO_2, "Land Use, Land-Use Change, and Forestry" represents a sink rather than a source, and is therefore in parentheses.

Table 3.3-7 U.S. Greenhouse Gas Emissions Allocated to Economic Sectors

Implied Sectors	1995 (million metric tons [mmt] CO2e)	2000 (mmt CO2e)	2007 (mmt CO2e)
Electric Power Industry	1,989.0	2,329.3	2,445.1
Transportation	1,685.2	1,919.7	1,995.2
Industry	1,524.5	1,467.5	1,386.3
Agriculture	453.7	470.2	502.8
Commercial	401.0	388.2	407.6
Residential	368.8	386.0	355.3
U.S. Territories	41.1	47.3	57.7
Total Emissions	6,463.3	7,008.2	7,150.1
Land Use, Land-Use Change, and Forestry (Sink)	(851.0)	(717.5)	(1,062.6)
Net Emissions (Sources and Sinks)	**5,612.3**	**6,290.7**	**6,087.5**

Table 3.3-8 U.S. Greenhouse Gas Emissions and Sinks

Gas/Source	1995 (mmt CO2e)	2000 (mmt CO2e)	2007 (mmt CO2e)
CO_2	**5,407.9**	**5,955.2**	**6,103.4**
Fossil Fuel Combustion	5,013.9	5,561.5	5,735.8
Non-Energy Use of Fuels	137.5	144.5	133.9
Iron and Steel Production and Metallurgical Coke Production	103.1	95.1	77.4
Cement Manufacture	36.8	41.2	44.5
Natural Gas Systems	33.8	29.4	28.7
CH_4	**615.8**	**591.1**	**585.3**
Enteric Fermentation	143.6	134.4	139.0
Landfills	144.3	122.3	132.9
Natural Gas Systems	132.6	130.8	104.7
Coal Mining	67.1	60.5	57.6
Manure Management	34.5	37.9	44.0
N_2O	**334.1**	**329.2**	**311.9**
Agricultural Soil Management	202.3	204.5	207.9
Mobile Combustion	53.7	52.8	30.1
Nitric Acid Production	22.3	21.9	21.7
Stationary Combustion	13.3	14.5	14.7
Manure Management	12.9	14.0	14.7
HFCs, PFCs, and SF6	**105.5**	**132.8**	**149.5**
Substitution of Ozone Depleting Substances	28.5	71.2	108.3
HCFC-22 Production	33.0	28.6	17.0
Electrical Transmission and Distribution	21.6	15.1	12.7
Total Emissions	**6,463.3**	**7.008.2**	**7,150.1**
Land Use, Land-Use Change, and Forestry (Sink)	*(851.0)*	*(717.5)*	*(1,062.6)*
Net Emissions (Sources and Sinks)	**5,612.3**	**6,290.7**	**6,087.5**

Secondary GHGs do not have a direct atmospheric warming effect, but indirectly affect terrestrial radiation absorption by influencing the formation and destruction of tropospheric and stratospheric ozone, or in the case of SO_2, the absorptive characteristics of the atmosphere.

Additionally, some of these gases may react with other chemical compounds in the atmosphere to form compounds that are GHGs. For example, the roasting of molybdenite in ore processing is among the sources of indirect GHG emissions to the atmosphere, specifically SO_2. Sulfur dioxide emissions are listed in **Table 3.3-9**. Levels of sulfur dioxide emissions have decreased since 1995 somewhat due to reductions in electricity generation, but primarily due to increased consumption of low sulfur coal from surface mines in the western states.

Table 3.3-9 U.S. Sulfur Dioxide (Indirect GHG) Emissions

Gas/Source	GHG 1995 (mmt)	GHG 2000 (mmt)	GHG 2007 (mmt)
SO_2	16.89	14.83	11.73
Energy (combustion, etc.)	15.77	13.80	10.89
Industrial Processes	1.12	1.03	0.84
Chemical manufacturing	0.26	0.31	0.23
Metals processing	0.48	0.28	0.19
Other	0.37	0.37	0.29

NAAQS do not exist for GHGs. In its Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the CAA (FR EPA-HQ-OAR-2009-0171), the EPA determined that GHGs are air pollutants subject to regulation under the CAA. GHGs' status as pollutants are due to the added long-term impacts they have on the climate because of their increased concentrations in the earth's atmosphere. Ongoing scientific research has identified that anthropogenic GHG emissions impact the global climate. Industrialization and the burning of fossil fuels have contributed to increased concentrations of GHGs in the atmosphere. GHGs are produced from both the direct process of coal mining as well as from the combustion of the mined coal. The amount of GHG emissions associated with both of these processes varies greatly based on mining techniques and combustion methodologies used.

The EPA has taken action to regulate six key GHGs - CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Because CO_2 is the most prevalent of the regulated GHGs, the EPA references the potential impact of GHG emissions in terms of their equivalence to CO_2 or CO_2e. In addition to the EPA estimates, the International Energy Agency estimated global emissions of CO_2e to be 29,000 mmt in 2008. On a regional scale, CDPHE (2014) estimated the total CO_2e emissions in 2010 to be 130 million metric tons for the State of Colorado.

The EPA has promulgated rules to regulate GHG emissions and the industries responsible under the Mandatory Reporting Rule (74 FR 56260, 40 CFR 98) and the Tailoring Rule (70 FR 31514, 40 CFR 51, 52, 70, 71). Under the EPA's GHG Mandatory Reporting Rule, coal mines subject to the rule are required to report emissions in accordance with the requirements of Subpart FF. Subpart FF is applicable only to underground coal mines and is not applicable to surface coal mines. Under the provisions of the Tailoring Rule (and a subsequent Supreme Court decision[6], a facility would be subject to PSD permitting if it has the potential to emit GHGs in excess of 100,000 tpy of CO_2e and the facility exceeded the PSD major source threshold for a criteria pollutant. For existing facilities this review would take place during any subsequent modifications to the facility. Based on emissions estimates for the Colowyo Coal Mine, no GHG reporting or permitting would apply to the facility; however, GHG reporting and permitting will apply to both the Craig and Hayden Generating Stations.

The first EPA regulation to limit emissions of GHGs imposed CO_2 emission standards on light-duty vehicles, including passenger cars and light trucks. 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. The EPA proposed regulations for GHG emissions from new and existing fossil fuel fired electric utility generating units in 2014 and plans to finalize the rules in 2015. Consequently, GHG emissions from fossil fuel fired power plants are likely to be increasingly regulated in the future.

3.3.11 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 is a likely by-product that would be emitted from haul trucks used during coal mining operations. 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 emissions associated with coal combustion occur at the facility where the coal is burned, not where it is being mined. At the mine, black carbon occurs as a result of the use of diesel vehicles. Black carbon is a component of the anthropogenic climate phenomenon; however, it is very short-lived, staying in the atmosphere only a few days to a few weeks. Although short lived, while in the atmosphere black carbon is the most strongly light-absorbing component of particulate matter[7]. Black carbon can absorb a million times more energy than carbon dioxide. Black carbon is a major component of "soot", a complex light-absorbing mixture that also contains some organic carbon.

[6] *Utility Air Regulatory Group v. EPA*, ___ U.S. ___, 134 S. Ct. 2427 (June 23, 2014)
[7] http://www.epa.gov/blackcarbon/basic.html

3.4 GEOLOGY

The Project Area is located in the north-central portion of the Danforth Hills coal field in the Rocky Mountain Coal Province of Tully (USGS 2008). This area is situated in the Wyoming Basin physiographic province, which is characterized by north- and east-trending ridges separated by steep canyons on the north, and to the south and west by steeply dipping, long and narrow hogbacks (CGS 2015, USGS 2008). Geology maps and stratigraphic sections can be found in various references (e.g., CGS 2015; USGS 2008; Colowyo 2007 (Figure 2.04.6-1, 2.04.6-2, Map 7); KEC 2005).

The Project Area lies within a region that is deformed by several major folds, indicating that various coal seams will fold over and split. The Project Area occurs on both the southern and northern limbs of the generally southeast-trending asymmetrical Collom Syncline and extends north toward the southeast-trending Axial Basin Anticline and east toward the north-northeast-trending Elkhorn Syncline (Colowyo 2007, USGS 2008). Two smaller unnamed anticlines also cross the southern part of the Project Area and trend slightly more eastward. The complex structures seen in the Project Area are overlain by younger sedimentary sequences that reflect upward-diminishing deformation. Periodic movements along the ancestral Axial Fault located north of the Danforth Hills coal field are believed to have been the source of the major deformation observed in the Project Area. The latest movement along the fault was during the Laramide Uplift, a Tertiary orogenic event (35-70 million years ago) which led to the uplift of the modern Rocky Mountains. This episode of uplift was a compressional event that eventually formed faults and major folds, such as the Collom and Elkhorn Synclines, and the prominent Axial Basin Anticline (BLM 2006).

3.4.1 Minerals

The coal seams in the Project Area are contained within the Upper Cretaceous Williams Fork Formation of the Mesaverde Group (BLM 2006, USGS 2008). The Mesaverde Group generally consists of a thinly to thickly interbedded succession of shale, siltstone, and sandstone that was deposited largely in a terrestrial environment. The Mesaverde Group is categorized into two formations: the overlying Williams Fork Formation, and the underlying Iles Formation (USGS 2008).

The Williams Fork Formation has been subdivided into five stratigraphic units. In ascending order these are the Fairfield coal group, barren interval, Goff coal group, Lion Canyon Sandstone, and Lion Canyon coal group. The Iles Formation has been subdivided into three stratigraphic units. In ascending order these are the Lower coal group, the Black Diamond coal group, and the Trout Creek Sandstone Member (USGS 2008). The Williams Fork and Iles Formations comprise a sedimentary rock sequence that originated from a deltaic and marginal marine depositional environment. The Trout Creek Sandstone Member consists of thick marine sandstone that represents the marine facies (beach) of the delta front. The high-quality, low-sulfur coal seams present in the Project Area occur within the Fairfield coal group of the Williams Fork Formation, which conformably overlies the Trout Creek Sandstone Member of the Iles Formation. The Williams Fork Formation is the surface rock covering most the Project Area. However, a narrow band of Iles Formation is found at the surface along the north limb of the Collom Syncline, with a small area of Mancos Shale occurring in the northern-most extension of the Project Area. Mancos Shale is also of Upper Cretaceous Age, and is the oldest of the geologic formations exposed in or near the Project Area. It is a thick marine, mostly massive sandy shale, with few thin-bedded coarser zones. Overlying these three units, particularly in stream valleys within the Project Area, are local occurrences of Quaternary alluvium, colluvium, and landslide deposits (Colowyo 2007).

Coal seams X and A through G789 have been or will be mined in the South Taylor area (Colowyo 2007). This includes 11 or more coal seams or seam groups (X34, A, B12, C35, D12, E2, F1, F356, Fab, G3, and G789 seams); the total thickness of the mined unit, including overburden, coal, and interburden, is approximately 600 feet (KEC 2005).

3.5 WATER RESOURCES

3.5.1 Surface Water

The Project Area is located in the Lower Yampa River basin, which is part of the Colorado River system. Specifically, it is located primarily within three small drainage basins. From west to east, they are Wilson Creek, Taylor Creek, and Good Spring Creek (**Figures 3-5a** and **3-5b**).

Additionally, the northernmost tip of the Project Area includes a very small section of the Jubb Creek watershed. All four of these streams flow generally northeast through narrow, steep-sided valleys on their way to ultimately join the Yampa River. Jubb Creek and Taylor Creek both join Wilson Creek downstream of the Project Area. In turn, Wilson Creek flows into Milk Creek and then into the Yampa River. Good Spring Creek also flows into Milk Creek several miles upstream of Milk Creek's confluence with Wilson Creek. The morphology, flow characteristics, and water chemistry of these surface water resources are described in the PR02 PAP (2007). The approved PAP (Colowyo 2015) incorporates the approved application for PR02, which included the expansion into the South Taylor Pit area.

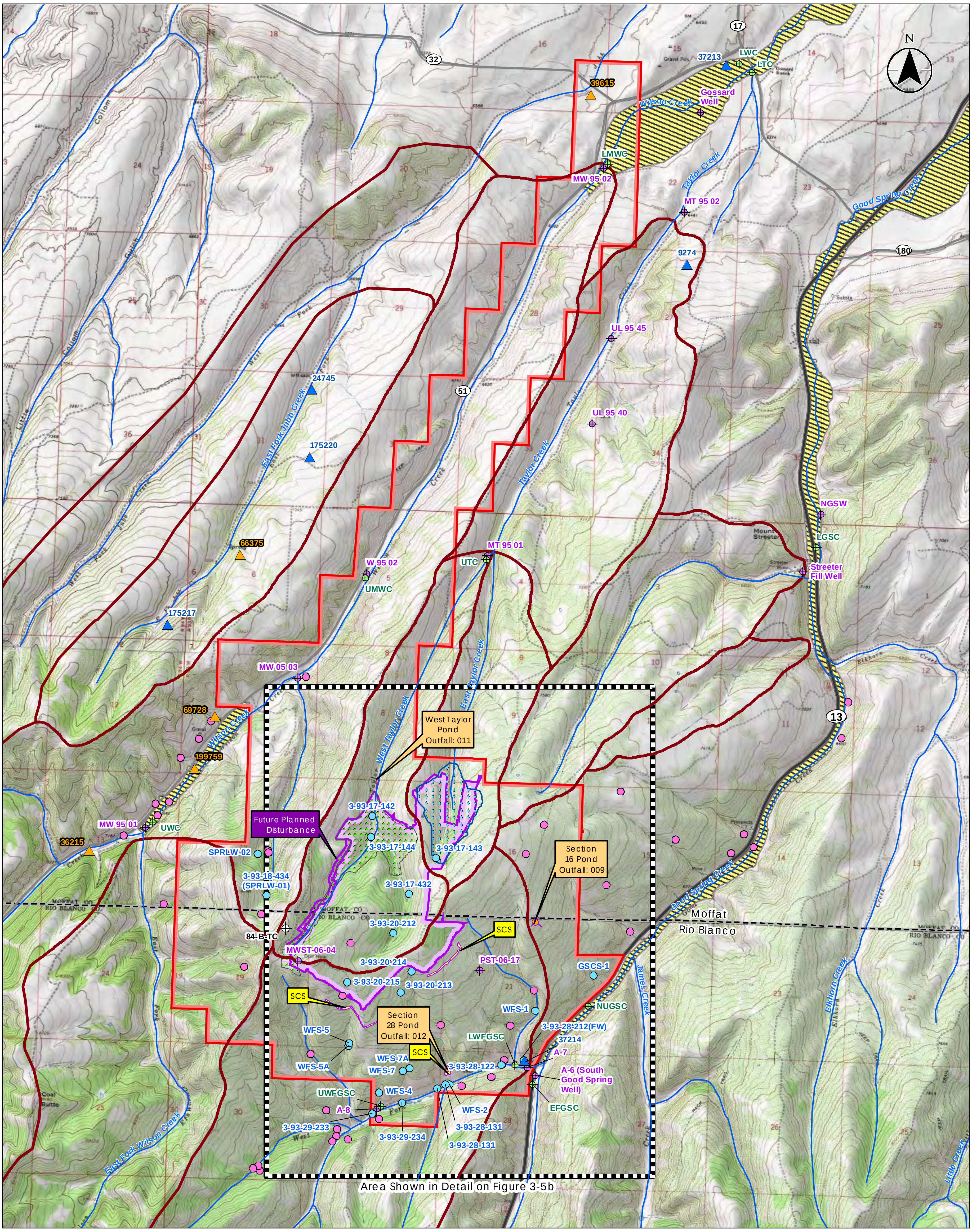
The morphology of the Project Area's surface water features is strongly influenced by geologic materials and geologic structure. The southern limb of the Collom Syncline dips gently to the north through the Project Area, and the pattern and orientation of most of the main tributary channels reflect this dip. These channels are relatively straight, having incised into the narrow valley fills and in some areas into bedrock associated with the Williams Fork Formation. Some of the upper reaches are bedrock controlled (Colowyo 2007). As is common with incised channels, many reaches have unstable cut banks and recently-slumped surfaces, although some riparian vegetation is also present. Outside the Project Area (downstream and to the north) stream valleys become less confined.

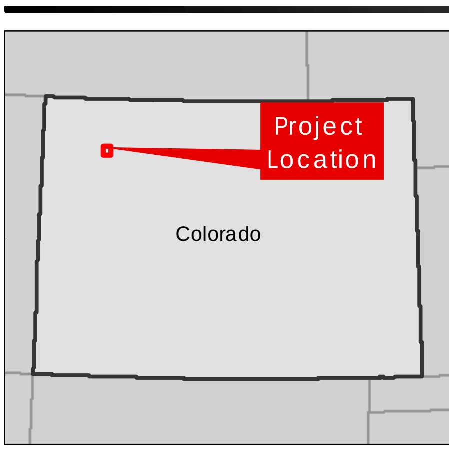
The Wilson Creek drainage is characterized by narrow upland areas, steeply sloping hillsides, and flat valley bottoms. The tributary channels are incised into bedrock. Historically, landslide debris has accumulated in the valley bottom and currently conveys bedrock groundwater discharge and side valley runoff to recharge surface water flows via bank seeps (Colowyo 2007). Taylor Creek flows generally parallel to Wilson Creek within the Project Area. Its watershed slopes are variable, but Taylor Creek itself is relatively steep. Further, bedrock limits incision and bank sloughing in this stream channel. Good Spring Creek's watershed is characterized by steep sloping uplands with exposed bedrock and narrow, flat valley bottoms. Incision has created deep gullies in some stream reaches, along with bank sloughing and resultant channel widening.

Wilson and Good Spring creeks are both perennial streams; the West Fork of Good Spring Creek also flows perennially due to a number of perennial springs. Taylor Creek flows intermittently (Colowyo 2007). Streamflows in and near the Project Area depend upon watershed runoff, seep and spring discharge, and/or groundwater-fed gaining reaches.

Monitoring records show that flows vary seasonally, with peaks generally snowmelt-based. For example, the U.S. Geological Survey (USGS) monitored stream flows in Wilson Creek north of the Project Area (Station #9250507) between 1981 and 1992. Streamflows ranged from 0 to 352 cubic feet per second (cfs). Another site on Wilson Creek (Station #9250600), located at nearly the same location, was monitored between 1975 and 1980, with flows ranging from 0.15 to 82 cfs. These data reflect the extreme variation in flow that can occur seasonally or annually in this area, and also indicate the importance of a long record when characterizing flow regimes (e.g., the four-year record from #9250600 compared to the (still relatively short) 10-year record from #9250507 show high flows for the period of record that were very different; neither may be truly representative). The USGS also monitored Taylor Creek (Station #09250510) flows between 1976 and 1992, and data show streamflows ranging from essentially 0 cfs to 18 cfs. For about three years in the mid-1970s, the USGS also monitored flows in Good Spring Creek (Station 09250400); peak flow was 58 cfs and the minimum was near 0 cfs (USGS 2015a).

All three of these streams were determined to have a base flow of 1 cfs or less, based upon a study that took place between 1978 and 1982 (Colowyo 2007). More recently (1996 and 1997), streamflows were monitored monthly at various other locations in these three streams, upstream of the USGS sites, in and near the Project Area (Colowyo 2007) (**Figures 3-5a and 3-5b**). Flows ranged from 0.2 cfs at Upper Wilson Creek (*site* UWC) to 41.25 cfs at Lower Wilson Creek (*site* LWC). Taylor Creek flow ranged from 0.01 cfs at Lower Taylor Creek (*site* LTC) to 2.04 cfs at Upper Taylor Creek (*site* UTC), and rates were considered typical of intermittent streams in the area. Good Spring Creek flows during that same period ranged from 0.85 cfs at New Upper Good Spring Creek (*site* NUGSC) to 17.0 cfs at Lower Good Spring Creek (*site* LGSC). Additional monitoring in the West Fork of Good Spring Creek was done in 1999 and 2000 (Colowyo 2007). Measured flows ranged from 0.18 cfs at Upper West Fork Good Spring Creek (*site* UWFGSC) to 7.0 cfs at Lower West Fork Good Spring Creek (*site* LWFGSC).





Legend

- Permited Domestic Well
- Permited Stock Watering Well
- Borehole
- Seep
- Spring
- Ground Water Monitoring Site
- Surface Water Monitoring Site
- Stream
- Drainage Boundary
- Alluvial Valley Floor
- Project Area
- Future Planned Disturbance
- Actual Disturbance since PR 02
- East Taylor Fill
- West Taylor Fill
- Sediment Pond
- Sediment Control Structure (SCS)
- County Road
- Highway
- County Boundary

0 4,000 8,000 Feet

1:48,000 (At Original document size of 11x17)

Notes

1: Coordinate System: NAD 1983 UTM Zone 13N

2: Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

Project Location

Rio Blanco & Moffat Counties
Colorado

Project

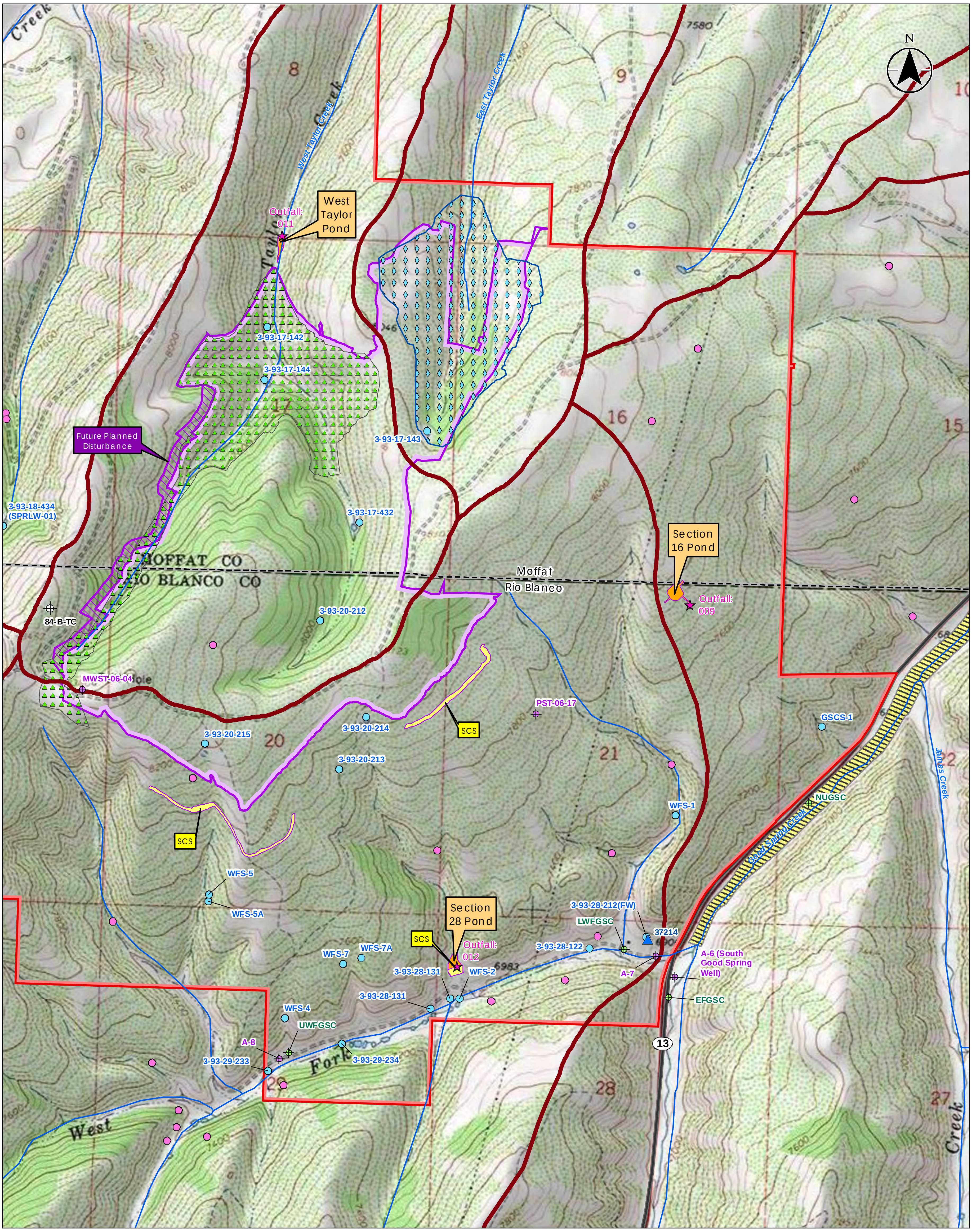
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

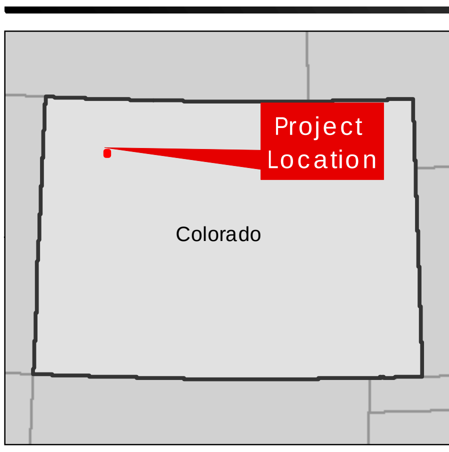
Figure No.

3-5a

Title

Hydrology





Notes
1: Coordinate System: NAD 1983 UTM Zone 13N
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- Permited Stock Watering Well
- Borehole
- Seep
- Spring
- Ground Water Monitoring Site
- Surface Water Monitoring Site
- Outfall Location
- Stream
- Drainage Boundary
- Alluvial Valley Floor
- Project Area
- Future Planned Disturbance
- Actual Disturbance since PR 02
- East Taylor Fill
- West Taylor Fill
- Sediment Pond
- Sediment Control Structure (SCS)
- Highway
- County Boundary

0 1,600 3,200 Feet
1:19,200 (At Original document size of 11x17)

Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
3-5b

Title
Hydrology

Local seeps and springs, resulting from groundwater discharge, may also contribute to surface water flows within the Project Area. Inventories covering the general area were undertaken in 1985 and 1997 (Colowyo 2007), and numerous seeps and springs were observed and characterized. In general, seep and spring discharge occurred: 1) with relatively deep soil accumulation immediately upslope and shallow bedrock downslope, 2) within valley bottom deposits, or 3) from sheer bedrock faces on hillsides. Colluvium and alluvium associated with the first two scenarios may mask or contribute to bedrock sources of the springs. Where the source was determined to be bedrock-related, the majority of the springs appeared to be contact springs that issue from the Williams Fork Formation. Contact springs are common where alternating rock sequences result in preferential flow paths developing along the interface of two layers with different hydraulic conductivities. Further, the springs in the West Fork of Good Spring Creek are the result of converging bedrock dips caused by an unnamed syncline that occurs along the channel (Colowyo 2007).

Figures 3-5a and 3-5b show the locations of identified seeps and springs that were located in the Project Area or within one mile of its boundary during seep and spring surveys done as part of the initial mine permitting work. Based upon measurements made in 1985 (Colowyo 2007), springs were estimated to contribute up to 1.9 cfs to flow in the West Fork of Good Spring Creek, and about 1cfs to surface flows in the mainstem of Good Spring Creek during peak flow periods. Contributions to surface flows from spring discharge during baseflow periods were much less, ranging from 0.03 cfs to 0.06 cfs at *site* WFGSC, and 0.03 cfs in the mainstem.

Water quality data for streams and selected seeps/springs were also collected during baseline monitoring (generally between 1996 and 1999, when flows were sufficient to do so). The stream sites (**Figure 3-5a**) show increasing total dissolved solids (TDS) concentrations in the downstream direction. For example, UWC had an average TDS of 590 mg/L during the mid-1990s baseline monitoring and LWC had an average TDS of 815 mg/L during the same period. While there has been no surface mining disturbance that has occurred in the Wilson Creek drainage, two sites (Upper Middle Wilson Creek [*site* UMWC] and Lower Middle Wilson Creek [*site* LMWC]) in the drainage had TDS averages of 685 and 790 mg/L, respectively. Further, TDS concentration varies seasonally with highest concentrations at any given stream site generally occurring during the low flow season (i.e., winter). The TDS reported at monitored springs and seeps was on average higher than reported in the streams. For example, at WFS-2 (**Figures 3-5a and 3-5b**), six samples had TDS concentrations ranging from a minimum of 1,590 mg/L to a maximum of 3,060 mg/L, with an average of 2,465 mg/L. This spring is located near the southern boundary of the Project Area in the West Fork Good Spring Creek watershed.

Iron concentrations have been elevated in the Yampa River downstream of Craig for a number of years, and as a result the lower Yampa is on the State's 303(d) list of impaired waters (CDPHE 2012a). EPA's Effluent Limitations Guidelines for coal mining (40 CFR Part 434) include iron, but note that high concentrations of total iron can be found in western coal regions. In fact, the development document (EPA 2001) notes that "In natural undisturbed conditions, surface water samples in the arid/semiarid western United States can register values for total iron as high as 40,000 mg/L (or 4%), due to the sediment that is collected as part of the water sample." Colowyo's baseline monitoring for PR02 (Colowyo 2007) indicated that dissolved iron concentrations in both the bedrock and alluvial aquifers are elevated. Further, baseline monitoring in Wilson, Taylor, and Good Spring creeks showed that as a whole total recoverable iron concentrations are on average below the USEPA aquatic life standard of 1.0 mg/L, but individual analyses are often greater than the standard (Colowyo 2007). More specifically, Good Spring and Taylor Creek iron concentrations had lower mean total recoverable iron concentrations (0.6 to 0.8 mg/L and 0.3 to 0.6 mg/L, respectively) than Wilson Creek had (0.7 to 5.6 mg/L) (Colowyo 2007). These localized groundwater and surface water data indicate that iron contributions from the three creeks and associated alluvial groundwater in the area may be incrementally contributing to iron loading in the Yampa, but are likely a minor component and not directly responsible for the impairment.

Selenium is another constituent of interest in the region's surface waters. Pre-project, background dissolved selenium rates in Lower Taylor Creek (*site* LTC) ranged from 0.001 mg/L to 0.016 mg/L. Pre-project background dissolved selenium rates ranged from 0.0005 mg/L to 0.03 mg/L 0.015 mg/L in lower Good Springs Creek (*site* LGSC), and from 0.001 mg/L to 0.036 mg/L in North Upper Good Springs Creek (*site* NUGSC) (Colowyo 2015). Water quality data collected from the Yampa River below Craig (USGS Station 09247600) between 1991 and 2011 (n=91) showed that close to half of the values were reported at less *than* the laboratory reporting level, and the maximum reported was 17.0 micrograms per liter (0.017 mg/L) (USGS 2015b). The chronic aquatic life standard for total selenium is 0.005 mg/L (CDPHE 2012b).

Pollutants conveyed in the atmosphere can deposit directly into waterbodies or onto upland land surfaces and in turn be carried in runoff to waterbodies. This deposit and conveyance can degrade water quality, even at great distances from the source or the airborne pollutant. Mercury is once such pollutant and its "deposition in a given area depends on mercury emitted from local, regional, national, and international sources" (EPA 2015*a*). Unlike many other pollutants, the primary source of mercury in streams is likely to be via atmospheric deposition (USGS 2015c). *EPA's latest published National Emissions Inventory (EPA 2014) indicates that coal-fired electricity generation units were the largest source of mercury emissions in 2011*. The common way of assessing a potential mercury problem in surface waters is using fish tissue, as mercury bioaccumulates. This is discussed in more detail in **Section 4.9.1**, including the fact that fish tissue analyses within the Yampa River watershed have shown elevated levels. Water quality data collected from the Yampa River below Craig (USGS Station 09247600) between 1991 and 2003 (n=52) showed that the majority of values were reported at less the laboratory reporting level, and the maximum reported was 0.10 micrograms per liter (USGS 2015b). The State of Colorado chronic aquatic life water quality standard for mercury is 0.01 micrograms per liter (0.00001 mg/L) (CDPHE 2012b).

3.5.2 Groundwater

Groundwater in and near the Project Area may be associated with: 1) perched aquifers of limited extent within bedrock of the Williams Fork Formation; 2) localized alluvial/colluvial aquifers, primarily along stream channels; and 3) the regional Trout Creek aquifer. Where found in area bedrock, groundwater is largely controlled by the existence of fractures instead of primary permeability within the rock composition itself. In particular, groundwater tends to occur in the synclinal axis of the folds in the area because there is increased fracturing in these areas. Each of the three units associated with groundwater are described briefly below.

The Williams Fork Formation is thick (up to 1,200 feet) and consists of interbedded coal, shale, sandstone, siltstone, and mudstones. Some of these beds contain localized groundwater and others serve as confining units. Where groundwater is found in the more permeable beds, it forms isolated perched lenses of limited extent and minimal production; thus the Williams Fork Formation is not considered to be a major aquifer in the region (Colowyo 2007). Hydraulic conductivity and transmissivity of the perched zones of the interburden within the Williams Fork Formation vary greatly (by up to 1 and 2 orders of magnitude, respectively), and is attributed to variability in the degree of rock fracturing (Colowyo 2007). In nearby mined areas where these perched zones have been intercepted, they have rapidly drained. Important among the less permeable beds is the KM Layer (also known as the Yampa Bed) of the Williams Fork Formation. It is a laterally-continuous, low-permeability clay bed that was formed from altered volcanic ash. The KM Layer is located beneath the mineable coal seams and serves as an aquitard separating the beds within the mined coal sequence from the underlying rocks including the lowest part of the Williams Fork Formation and the Trout Creek Sandstone. Additionally, geologic structure in the Project Area influences groundwater flow through the Williams Fork Formation. In the southern part of the Project Area, near the South Taylor pit, the presence of an unnamed syncline and an unnamed anticline have axes that plunge toward the northeast. These features create a dip-slope towards Good Spring Creek, which in turn results in groundwater discharge locally from the Williams Fork Formation (Colowyo 2007).

Beneath the Williams Formation is the Iles Formation. An upper member of the Iles Formation, known as the Trout Creek Sandstone, forms the uppermost aquifer of regional extent within and near the Project Area. While previous drilling in the area found the Trout Creek Sandstone to be dry in one location (Well 84-B-TC, **Figures 3-5a and 3-5b**) other locations closer to the axis of the Collom Syncline were saturated and had transmissivity and hydraulic conductivity values indicative of moderate permeability (Colowyo 2007). The potentiometric surface associated with this confined aquifer has an elevation of between 7,050 and 7,100 feet amsl where it is beneath the South Taylor mining area (Colowyo 2007). In this area, the Trout Creek Sandstone aquifer underlies the lowest coal seam to be mined by approximately 590 feet.

The alluvial materials found along Project Area streams also generally contain and transmit groundwater. Colowyo (2007) specifically mapped alluvial aquifers along Wilson Creek, West Fork Good Springs Creek, and Good Springs Creek within the Project Area as well as outside of it. Along Taylor Creek, an alluvial aquifer is identified primarily downstream of the Project Area, with only a very short reach occurring within the boundary. Alluvial aquifers in and near the Project Area have moderate to high permeability where encountered, with a wide range of hydraulic conductivity values. Colowyo considers stream-laid alluvium as well as colluvium within the alluvial category.

Groundwater has been monitored in or near the Project Area since 1983, with wells established in each geologic unit where groundwater may occur (alluvium, certain lenses of the Williams Fork Formation, and the Trout Creek Sandstone). These monitoring data have included elevation (i.e., depth to water) and/or water quality. **Figures 3-5a and 3-5b** show groundwater monitoring locations in the area, from various previous investigations, but not all of these sites have been monitored over the same period of time. As expected, groundwater chemistry in the area varies with the geologic source. The Williams Fork Formation tends to produce calcium- or sodium-bicarbonate water type, and a low to moderate concentration of TDS (ranging from 440 to 640 mg/L in a 1985 study and ranging from 890 to 970 in a mid-1990s study (Colowyo 2007)). The Trout Creek Sandstone groundwater data varies more in regard to water type (ranging from sodium-sulfate, sodium-bicarbonate type, to mixed-cation-bicarbonate with equal percentages of calcium, magnesium, and sodium, The TDS range in that aquifer ranged from 600 to 710 mg/L in the 1985 study and from 680 to 1,180 in the mid-1990s study (Colowyo 2007). Water quality in the bedrock aquifers does not appear to substantially vary seasonally, based upon a 1985 investigation (Colowyo 2007). Groundwater produced in the alluvial valley fill has varying water quality, but is generally typed as magnesium-sulfate or magnesium- and/or calcium-bicarbonate. TDS is moderate to high, with concentrations ranging from 420 to 3,780 mg/L, and shows seasonal variations. Colowyo 2007 also includes data tables summarizing TDS from studies subsequent to the 1985 investigation and those later results are encompassed within the 1985 range.

These small perched aquifers associated with the Williams Fork Formation have no beneficial uses in or near the Project Area, primarily due to their size and lack of sufficient yield. The Trout Creek Sandstone is used regionally, but its TDS concentration, as well as elevated iron and manganese, limit use for domestic water. Depth to water in the Project Area also hinders usage of this bedrock groundwater. The mine's potable water supply well located about 2 miles (3 km) northeast of the Project Area (completed at a depth of 1,000 feet in 2004) produces less than 4 gallons per minute (gpm) (Colowyo 2007). Similarly, the alluvial aquifer in the area often has similar water quality issues that hamper its use for domestic use. There are several non-Colowyo registered/permitted domestic or stock watering wells located within a mile of Project Area (Colowyo 2007) (**Figure 3-5a**).

Pollutants contained in the residuals from the combustion of coal in power plants and disposed of through burial can be conveyed into groundwater aquifers. Colowyo's coal is transported from the mine by rail to coal markets, including the Craig Generating Station located approximately 26 miles (42 km) northeast of the Colowyo Mine. Coal combustion residuals (CCRs) generated as part of the coal combustion process at the Craig Generating Station include boiler fly ash, boiler bottom ash, and scrubber sludge. These CCRs produce leachate that contains elevated levels of aluminum, barium, chromium, boron, and molybdenum (Koehler 2002). These CCRs are disposed of in a disposal site at the Trapper Mine located approximately one mile from the Craig Generating Station. The disposal site is under the jurisdiction of SMCRA and is approved to receive CCRs under a Certificate of Designation from Moffat County, with regulatory oversight from CDPHE.

SMCRA and CDHPE monitoring and reporting requirements apply to the Trapper Mine disposal site. CCRs generated at the Craig Generating Plant and disposed of at the Trapper Mine disposal site must be placed at least 10 feet above the projected post-mining groundwater saturation zone. The CCRs are covered with 6 feet of cover (5 feet of overburden and 1 foot of topsoil) and any reconstructed permanent surface water drainage is located a minimum of 50 horizontal feet from the CCRs (Koehler 2002). Modeling of the site has been conducted to provide data associated with cross-stratal migration of CCR leachate, travel time of the CCR leachate, and groundwater/surface water interaction associated with the disposal site; the studies indicated that the low permeability of the CCRs and the low infiltration rate of precipitation should limit the risk of water movement through and from the CCRs (Kaldenbach et al. 2001, Koehler 2002). A groundwater monitoring network is in place to ensure that the placement of CCRs in the disposal site is effective in isolating or immobilizing leachate from the CCRs. The results of the monitoring indicate that the water quality downgradient of the CCR disposal site is similar to the water quality in other areas of the Trapper Mine that are not associated with CCR disposal; only low levels of the contaminants of concern were detected as a result of the final sampling in 2002 (Koehler 2002).

3.6 VEGETATION

Vegetation surveys that cover the Project Area have been conducted from 1985 to 2005 (Colowyo 2007). The results of those surveys as they relate to the Project Area are depicted in **Table 3.6-1** (Colowyo 2007). The acreages include portions of land added by PR02 as well as areas that were previously part of the approved permit boundary. Therefore, the overall acreage is larger than the amount of land added to the permit boundary from PR02. The location of the vegetation communities are shown in **Figure 3-6**. A discussion of each vegetation community is presented below and taken from the approved permit (Colowyo 2007 and 2012a).

Table 3.6-1 Vegetation Communities within the Project Area

Vegetation Community	Acres	Percent of Total
Mountain Shrub (mesic and xeric)	4,090.5	57.6
Sagebrush (mesic and xeric)	2,334.4	32.8
Aspen Woodland	292.6	4.1
Juniper Shrub	140.9	2.0
Bottomland	81.2	1.1
Cropland	81.1	1.1
Grassland	50.3	0.7
Riparian	38.5	0.5
Pond	6.0	0.1
Totals	**7,115.5**	**100.0**

Source: Colowyo 2007

3.6.1 Mountain Shrub Community

The mountain shrub community covers approximately 4,090.5 acres, or 57.6 percent of the Project Area. This community is primarily found at higher elevations occupying the relatively flat uplands, steep southern-facing slopes (xeric sub-types), and steep northern-facing slopes (mesic sub-type). A total of 102 plant species were found in the mountain shrub community during surveys. Dominant shrub species found in the community include mountain snowberry (*Symphoricarpos oreophilus*), Gambel oak (*Quercus gambelii*), serviceberry, and mountain big sagebrush (*Atremisia tridentata ssp. vaseyana*). Grasses and forbs found in this community include bluegrass (*Poa* spp.), cheatgrass (*Bromus tectorum*), and tailcup lupine (*Lupinus caudatus*). In more mesic sites, aspen may intergrade with this community. Except where this community is over-mature and therefore, largely impenetrable, it provides excellent cover, forage, and browse for resident deer and elk herds.

3.6.2 Sagebrush Community

The sagebrush vegetation community covers approximately 2,334.4 acres, or 32.8 percent of the Project Area. This community is principally found at lower elevations occupying the relatively flat uplands or benches, some steeper north-facing slopes (mesic sub-types), and steeper southeast-facing slopes (xeric sub-types). A total of 93 plant species were found in the sagebrush community. Common shrub species include mountain big sagebrush, Wyoming big sagebrush (*Atremisia tridentata ssp. wyomingensis*), mountain snowberry, snakeweed (*Gutierrezia* sp.), and low rabbitbrush (*Chrysothamnus viscidiflorus*). Grasses and forbs found in these areas include Japanese brome (*Bromus japonicus*), western wheatgrass (*Pascopyrum smithii*), Sandberg bluegrass (*Poa sanbergii*), and crested wheatgrass (*Agropyron desertorum*). In several areas near Sections 15 and 16, range improvements have been made which have altered the vegetation. The large shrubs have been removed to allow the understory species to be more productive. The practice has removed most of the serviceberry and in the process, most of the sagebrush.

3.6.3 Aspen Woodland Community

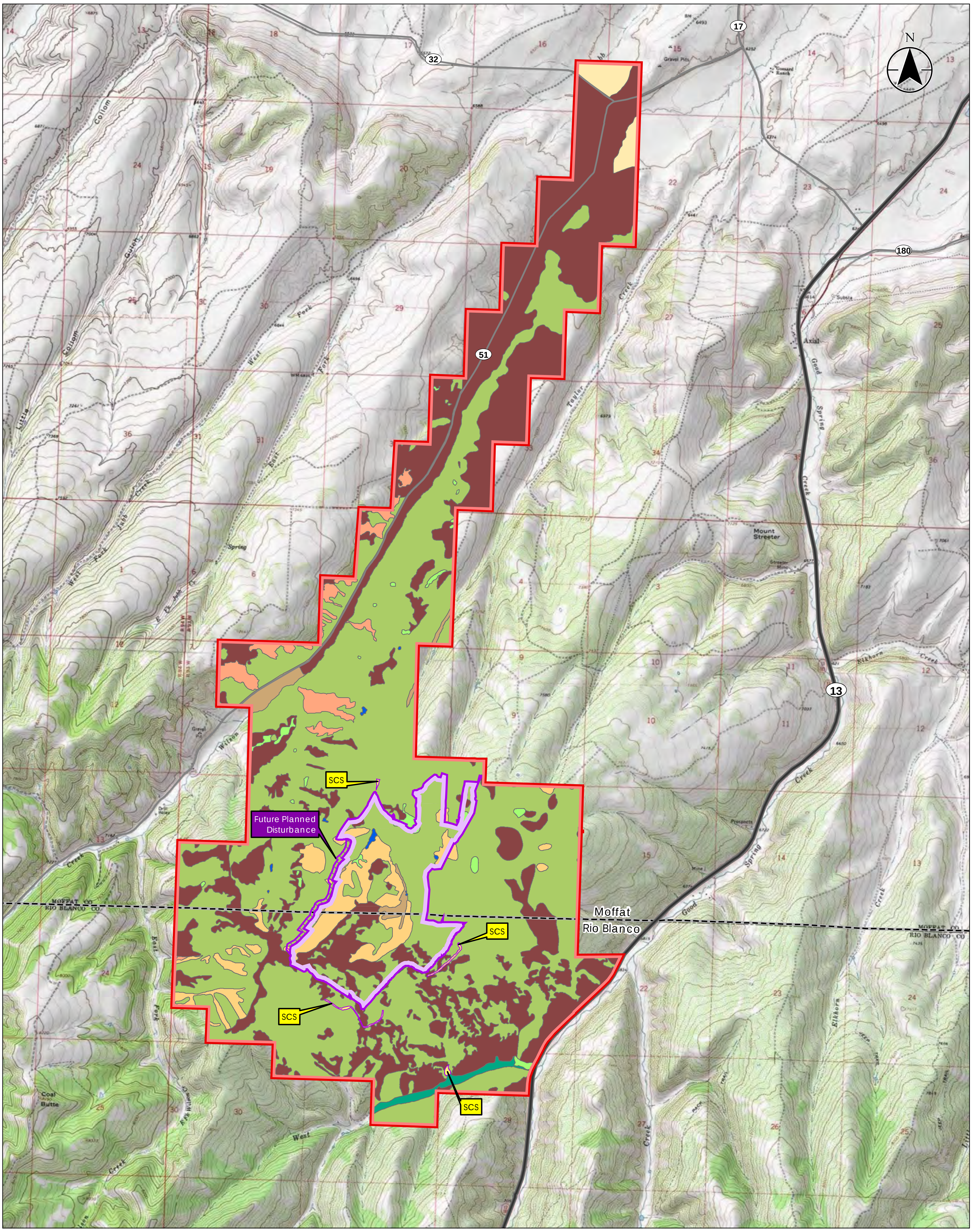
The aspen woodland community covers approximately 292.6 acres, or 4.1 percent of the Project Area. This community is commonly located on high elevation, steep slopes, and drainage bottoms that generally have northeast to northwest aspects. During surveys, a total of 63 plant species were found in this community. Along with aspen common species include mountain brome (*Bromus marginatus*), blue wild rye (*Elymus glaucus*), bluegrass (*Poa agassizensis*), nettleleaf giant hyssop (*Agastache urticifolia*), mountain snowberry, and chokecherry (*Prunus virginiana*).

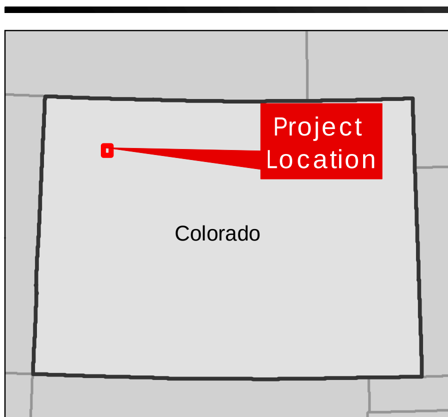
The aspen community in the Project Area appears to have been noticeably affected by the recent drought. A high percentage of mature aspen trees have recently died leading to a lower live tree density and a dense understory of chokecherry and mountain snowberry. The aspen stands in more mesic sites are healthy, whereas stands that occupy or have expanded to more xeric sites have lost most of their mature overstory. Young aspen seedlings and saplings are found in these areas and will likely see a return to a denser aspen tree overstory.

3.6.4 Juniper Shrub Community

The juniper shrub community covers approximately 140.9 acres, or 2.0 percent of the Project Area. This community is located on the steeper slopes in the drier, rockier, and skeletal soil that cover the northern portions of the Project Area. The dominant species occurring in this community include junipers (*Juniperus spp.*), Wyoming big sagebrush, mountain big sagebrush, mountain snowberry, crested wheatgrass, cheatgrass, Sandberg bluegrass, and western wheatgrass.

The juniper shrub community is visually dominated by juniper trees with assorted shrubs, grasses, and forbs occupying the areas between the trees. Most of this community is located on steep, relatively barren and erodible soils along the drier, northern edge of the Project Area. A small portion of this community can be found on the flat tops on the slopes where it intergrades into the sagebrush dominated uplands. The juniper trees appear healthy and expanding into both the mesic and xeric sagebrush areas that are adjacent to this community type.





Project Area

Future Planned Disturbance

Actual Disturbance since PR 02

Sediment Control Structure (SCS)

Vegetation Type

- Aspen
- Bottomland
- Cropland
- Grassland
- Juniper
- Mountain Shrub
- Pond
- Riparian
- Sagebrush

County Road

Highway

County Boundary

0 4,000 8,000 Feet

1:48,000 (At Original document size of 11x17)

Notes
1: Coordinate System: NAD 1983 UTM Zone 13N
2: Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

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Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
3-6

Title
Vegetative Communities

3.6.5 Bottomland Community

The bottomland community covers approximately 81.2 acres, or 1.1 percent of the Project Area. This community is largely a physiographic type that exhibits an aggregate of vegetation sub-types (wetland, sagebrush, riparian bottom, grassland, and occasionally mountain shrub) that are found in the relatively flat alluvial and colluvial deposits along the numerous drainages within the Project Area. The bottomland community generally has deep soils with higher moisture levels due to the external contributions from slope outwash, flood flows, lateral subirrigation, and the occasional seeps and springs. During field surveys, a total of 92 species were observed in this community. Dominant shrubs include rubber rabbitbrush (*Chyrsothamnus nauseosus*), basin big sagebrush (*Artemisia tridentata var. tridentata*), mountain snowberry, and silver sage (*Artemisia cana*). Grasses and forbs that may be present include western wheatgrass, Japanese brome, thickspike wheatgrass (*Agropyron dasystachyum*), and cheatgrass.

3.6.6 Grassland Community

The grassland community covers approximately 50.3 acres, or 0.7 percent of the vegetation in the Project Area. This community is predominately an early-seral community found in the flat uplands where natural and prescribed burns have removed the sagebrush or mountain shrub overstory vegetation and the usually sub-dominant grasses have flourished. Occasional small patches of the grassland community can be found along high elevation ridges and summits where thin soils and high winds have inhibited shrub densities. The dominant plant species observed in the grassland community include: western wheatgrass, cheatgrass, Sandberg bluegrass, Japanese brome, and prairie pepperweed (*Lepidium densiflorum*). Shrubs which may be present in low amounts include holly grape (*Mahonia repens*), low rabbitbrush, mountain snowberry, and mountain big sagebrush.

The grassland community type in the Project Area has been divided into two arbitrary subtypes based on whether or not the area is naturally lacking a shrub component or was naturally burned in the past (grassland). The sagebrush reduction areas are generally located on the relatively flat upland areas surrounded by overmature stands of mountain sagebrush and just north of the transition zone between mountain shrub and sagebrush zones. Most of the older sagebrush reduction areas now contain enough reinvading sagebrush to be classified as sagebrush, but the more recent areas exhibit only a few plants and can still be classified as grassland. The naturally occurring grasslands are scattered throughout the Project Area in small patches. Some of these patches are located along high-elevation, wind-swept ridgelines, and summits where thin soils favor grass and forb development over shrubs. Annual bromes have invaded some of the past natural burn areas (especially at lower elevations) and have slowed the re-invasion of sagebrush into these areas.

3.6.7 Riparian

Riparian vegetation accounts for approximately 38.5 acres, or 0.5 percent of the vegetation in the Project Area. The majority of this vegetation type is found along Wilson Creek and is dominated by boxelder (*Acer nugundo*) trees of various diameter classes. The understory is similar to the bottomland vegetation type. Other species commonly found in this area include

Canada thistle (*Cirsium arvense*), rubber rabbitbrush, Great Basin wildrye, burdock (*Arctium* spp.), and Kentucky bluegrass (*Poa pratensis*).

3.6.8 Other Communities

The remaining mapped vegetation communities (cultivated fields/cropland and ponds) cover a total of 87.1 acres, or 1.2 percent of the Project Area. These areas have been generally altered from their natural state. As such, many non-native species may occur in these areas as well as some native vegetation.

3.6.9 Noxious Weeds

Noxious weeds are those species which have been determined by the State of Colorado as detrimental to the environment or agriculture. Since 1990 the State's natural and agricultural resources have been protected by the Colorado Noxious Weed Act (35-5.5 CRS). The noxious weed list is prioritized into three categories, A, B and C. List A plants are designated for elimination on all county, state, federal, and private lands. List B includes plants whose continued spread should be stopped. List C plants are selected for recommended control methods. There are currently 76 species on the State's noxious weed list (CWMA 2015). The Moffat County Board of County Commissioners adopted the Moffat County Undesirable Plant Management Plan on November 25, 1991 to formalize weed control procedures within the County (Moffat County 2001). This plan details methods of Integrated Plant Management to implement weed management within the County. Since the late 1990s, there has been a weed management partnership that includes Moffat County Weed and Pest Department, Colowyo, and several other agencies and individuals (*J. Comstock*, personal communication, *July 5, 2015*).

During vegetation surveys conducted in 1985, a total of four noxious weed species were observed. Those species include quackgrass (*Elymus repens*), musk thistle (*Carduus nutans*), houndstongue (*Cynoglossum officinale*), and Canada thistle. In general, when these species were observed, their densities were low and were only occasionally in sufficient quantities to be detected by ground cover sampling.

3.7 WETLANDS AND RIPARIAN ZONES

Wetlands and riparian areas serve an important role in the environment. Often, these areas are used by wildlife as refuge, and they increase the biodiversity in a given area by increasing habitat diversity. Surveys for wetlands and riparian areas were conducted within the vegetation study area (**Section 3.6**), and surveys for wetlands and Waters of the U.S. (WOTUS) were conducted over some or all of the Project Area (JBR 1997a, JBR 1997b).

3.7.1 Wetlands and Riparian Zones

Management of wetlands is generally under the jurisdiction of the U.S. Army Corps of Engineers (USACE). To be considered a jurisdictional wetland, an area must meet three criteria: hydric vegetation, hydric soil indicators, and the presence (or evidence) of inundation. Surveys conducted for wetlands within the Project Area (JBR 1997a) followed the USACE "Corps of Engineers Wetlands Delineation Manual" (USACE 1987).

Streamside wetlands form the bulk of the wetlands that were surveyed (JBR 1997a). They are typical of Colorado mountain valley wetlands ranging from moist and wet meadows (within alluvial deposition areas) to heavily vegetated herbaceous strips (along stream banks). These wetland types are typically heavily vegetated herbaceous meadows to moist meadow communities because they receive moisture from later subirrigations along the stream channel. Specifically, wetlands were delineated in and near the Project Area along Taylor Creek and Good Spring Creek, as well as certain tributaries to those streams. Wilson Creek does not appear to have been included in this study and although it occurs in the Project Area it has not been disturbed by mining activities. Riparian vegetation was mapped along Wilson Creek and is described below (JBR 1997). The National Wetlands Inventory (USFWS 2015) is consistent with information provided above, showing small wetlands along these streams (as well as along Wilson Creek), within and immediately adjacent to the Project Area. As expected, those associated with the intermittently flowing Taylor Creek are less extensive than those associated with the perennial streams.

On occasion, wetlands developing along the margins of older, more stable stock ponds exhibit emergent wetland communities. Two very small stock watering ponds occur in the Project Area (Colowyo 2007). Though largely devoid of vegetation, at least one of these at some time was associated with a very small amount of wetland vegetation.

Riparian vegetation has been mapped streamside along Wilson Creek within the Project Area (Section 5, T3N, R93W) (Harner and Associates, Inc. 1985). Specifically, it was classified as a riparian woodland dominated by boxelder trees. In addition, "meadow" vegetation was mapped along Wilson, Taylor, Good Spring, and the West Fork of Good Spring creeks, noting that the meadow type varied within this category depending upon moisture and soil characteristics. Some vegetation noted to occur within these meadows could denote wetland communities (sedge [*Carex* spp.], cattail [*Typha* spp.], and bulrush [*Schoenoplectus lacustris*]), however, they were not delineated as part of that investigation. They likely coincided with wetlands subsequently delineated by JBR (1997a). Wilson, Taylor, Good Spring, and West Fork Good Spring creeks were mapped with riparian corridors as well (Colowyo 2007), though these were not continuous. Small wetland communities exist in some of these areas, but were not separately delineated. However, along each bank of Wilson Creek, a persistent small emergent palustrine emergent wetland community, in the form of a very narrow stringer, was noted (Colowyo 2007). Dominant vegetation along this narrow wetland corridor includes: Baltic rush (*Juncus balticus*), broad-leaved cattail (*Typha latifolia*), spikerush (*Eleocharis palustris*), Nebraska sedge (*Carex nebrascensis*), redtop (*Agrostis alba*), and bulrush.

3.7.2 Waters of the U.S.

WOTUS are defined under 40 CFR 230.3(s) (2004)[8] as the following:

1. *All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;*

[8] This rule will be changed effective August 28, 2015; however, the new rule will not protect any new types of waters that historically have not been protected by the CWA.

2. *All interstate waters including interstate wetlands;*
3. *All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:*
    - i. *Which are or could be used by interstate or foreign travelers for recreational or other purposes; or*
    - ii. *(From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or*
    - iii. *Which are used or could be used for industrial purposes by industries in interstate commerce;*
    - iv. *WOTUS do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with EPA.*
4. *All impoundments of waters otherwise defined as WOTUS under this definition;*
5. *Tributaries of waters identified in paragraphs (s)(1) through (4) of this section;*
6. *The territorial sea;*
7. *Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (s)(1) through (6) of this section; waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not WOTUS.*

WOTUS include channels that show evidence of conveying flowing water on at least an average annual basis and have the presence of a defined bed and banks. While wetlands are a type of WOTUS and were reported to the USACE (JBR 1997a), non-wetland WOTUS within the Project Area were separately reported to the USACE (JBR 1997b). That study found approximately 51 acres of jurisdictional WOTUS associated with Good Spring Creek and tributaries, and Taylor Creek. Only 2.12 acres were located inside the disturbance footprint for PR02.

Dredge and fill activities within jurisdictional areas are regulated by the USACE. If wetlands are present adjacent to a WOTUS, USACE jurisdiction extends beyond the ordinary high water mark of the waters to the limit of the adjacent wetlands.

3.8 FISH AND WILDLIFE RESOURCES

The wildlife habitat located within the Project Area is predominately composed of sagebrush and mountain shrub vegetation communities. Other common habitat types include aspen woodland, grassland, juniper scrub, and bottomland types found in drainages and basins. Minor habitat types that encompass 0.5 percent or less of the Project Area include disturbed areas, cultivated land, improved pasture, and wetlands.

3.8.1 Mammals

Many mammal generalist species occur in and around the Project Area. Common predators include coyote (*Canis latrans*), red fox (*Vulpes vulpes*), mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), and black bear (*Ursus americanus*). Medium sized mammals include: porcupine

(*Erethizon dorsatum*), striped skunk (*Mephitis mephitis*), and American badger (*Taxidea taxus*). Other small mammals that may occur in the Project Area include: desert cottontail (*Sylvilagus audubonii*), mountain cottontail (*S. nuttallii*), white-tailed jackrabbit (*Lepus townsendii*), white-tailed prairie dog (*Cynomys leucurus*), golden-mantled ground squirrel (*Spermophilus lateralis*), northern pocket gopher (*Thomomys talpoides*), least chipmunk (*Tamias minimus*), and deer mouse (*Peromyscus maniculatus*) (Colowyo 2012*a*).

Habitat for bats is present in the Project Area and includes: trees, shrubs, and rocky outcrops. While no focused bat surveys have been completed, several species of bats have the potential to occur. Those species include: western small footed myotis (*Myotis ciliolabrum*), little brown myotis (*M. lucifugus*), and silver haired bat (*Lasionycteris noctivagans*) (Colowyo 2012*a*).

3.8.2 Big Game

Mule deer (*Odocoileus hemionus*) and elk (*Cervus elephus*) are regularly found in the Project Area. Aerial surveys for mule deer and elk are conducted annually by CPW. The results from the most recent surveys are summarized below, in addition to descriptions of seasonal big game habitat within the Project Area. Other big games species that occur in the Project Area include pronghorn antelope (*Antilocapra americana*) and moose (*Alces alces*).

3.8.2.1 Mule Deer

Mule deer within the Project Area are part of the White River mule deer herd (Data Analysis Unit [DAU] 7), which is the largest mule deer herd in Colorado. The total herd population was estimated to be 71,380 animals in 2007 and 37,530 in 2014 (CPW 2015a). The herd population exhibited an increasing trend from 2001 to 2005. The decrease between 2007 and 2014 may be due to a series of severe winters and droughts, which affected the area.

A five-year average of annual aerial winter counts resulted in a range of 184 to 918 mule deer using the vicinity around the Project Area during the winter (Colowyo 2007). Based on CPW estimates, fewer mule deer winter in the area compared to elk. However, like elk, mule deer abundance and distribution in this region can vary dramatically year-to-year depending on the severity of the winter (Colowyo 2007 and 2013*a*).

Four types of mule deer range occur within the Project Area, with three of them being shown on **Figure 3-7** as all of the Project Area is mule deer summer range. Mule deer winter range is located on the north and southeast portions of the Project Area and totals approximately 2,764.8 acres (52.9 percent of the Project Area). The northern and southeastern portions of the Project Area contain approximately 3,061.6 acres (43.0 percent of the Project Area) of winter concentration area. Mule deer severe winter range exists on the southeast corner of the Project Area and is approximately 1,402.5 acres (19.7 percent of the Project Area). Seasonal use of the Project Area is dependent on snow levels, which vary from year to year. Unlike elk, mule deer do not concentrate in particular areas when fawning; therefore, no production habitat is delineated.

Mule deer use the area in and around the Project Area year-round, though use of sites in winter is dependent on snow depths. South-facing slopes with sagebrush are more likely to be used in winter. Also, deer are known to heavily use previously mined areas that have been reclaimed as grasslands (Colowyo 2011).

3.8.2.2 Elk

Elk within the Project Area are part of the White River herd (DAU 6) as defined by CPW. The population of the White River elk herd has grown steadily beginning in the early 1980s, and CPW has been attempting to reduce the herd size. As a result, the herd exhibited a declining trend from 2001 to 2005, though the population remained well within the 2005 management goal of 32,000 to 39,000 animals (Colowyo 2007). In 2007, the herd was estimated to be 43,870 animals. In 2014, the total herd population was estimated at 39,900 animals, and represents the largest elk herd in Colorado (CPW 2015a).

Within the general area, winter aerial surveys of elk from 1994 through 1997 found that elk populations varied greatly. Populations varied from a high of 1,590 and a low of 259. This represents 5.5 and 0.9 percent, respectively, of the total White River herd. This variation is based on both snow depths and temperature. In general, most observations of elk during the winter are made within the mountain shrub habitat type (Colowyo 2007).

Elk seasonal ranges within the Project Area include: winter concentration areas, production areas, and severe winter range (**Figure 3-8**). CPW data indicates that the entire Project Area is both summer and winter range for elk. Winter concentrations areas are located in the northern portion of the Project Area and total 1,534.7 acres (21.6 percent of the Project Area). Elk production areas are located in the southwest portion of the Project Area and total 1,203.7 acres (16.9 percent of the Project Area). There is also approximately 1,762.7 acres of elk severe winter range within the northern portion of the Project Area (24.8 percent of the Project Area).

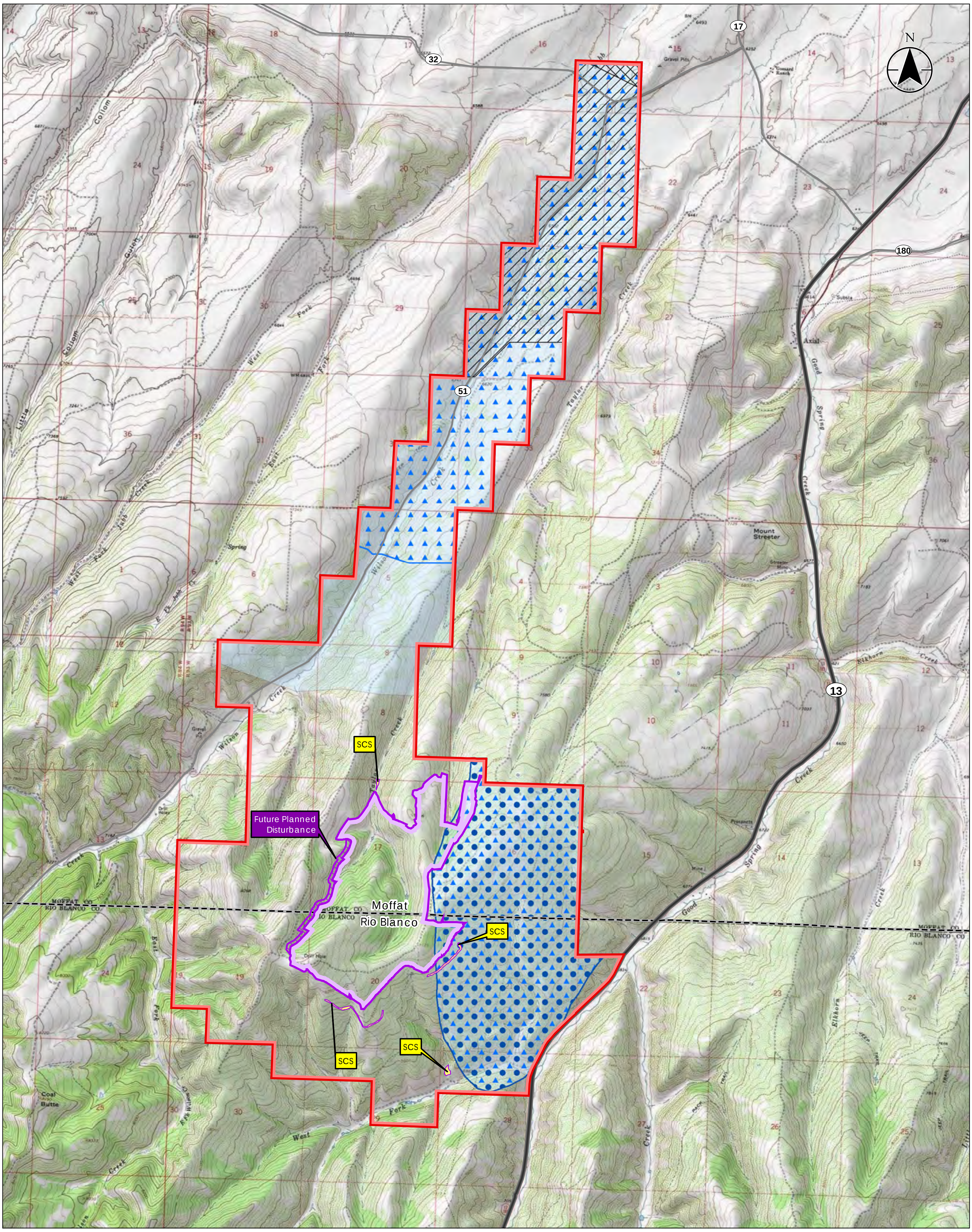
Seasonal use of the Project Area would be dependent on snow levels, which vary from year to year. The larger geographic region from the Danforth Hills to the Axial Basin is considered an elk migration area.

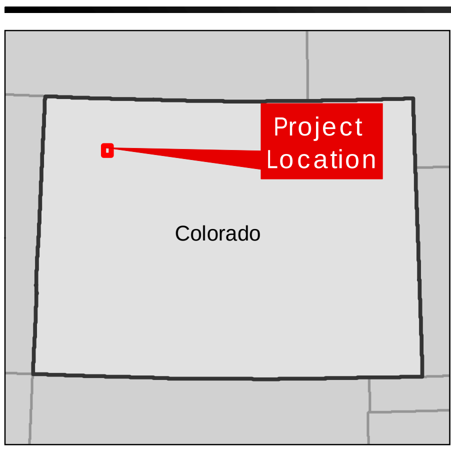
Elk are known to heavily use areas of the existing mine that have been reclaimed as grasslands throughout most of the year, but they are prevalent in the winter and spring. Elk wallows have been noted in most of the dense aspen stands in the area (Cedar Creek 2006).

3.8.2.3 Pronghorn Antelope and Moose

The Project Area occurs within the A-34 unit for pronghorn antelope. In 2014, this unit had an estimated population of 330 individuals, and in 2007 there was an estimated 340 animals. This is approximately 0.6 percent of the statewide population (CPW 2015a). The Project Area contains approximately 909.6 acres of overall range for pronghorn habitat (12.8 percent of the Project Area) and 27.0 acres of winter habitat (0.4 percent of the Project Area). Both of these habitats occur at the northernmost portion of the Project Area (**Figure 3-7**).

The Project Area does not occur within any mapped unit for moose. Nor is there any designated habitat for this species within the Project Area although they are known to travel through the area.





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- Project Area
- Future Planned Disturbance
- Actual Disturbance since PR 02
- Sediment Control Structure (SCS)

Pronghorn & Mule Deer Habitat

- Pronghorn Winter Range
- Pronghorn Overall Range
- Mule Deer Severe Winter Range
- Mule Deer Winter Concentration Area
- Mule Deer Winter Range
- County Road
- Highway
- County Boundary

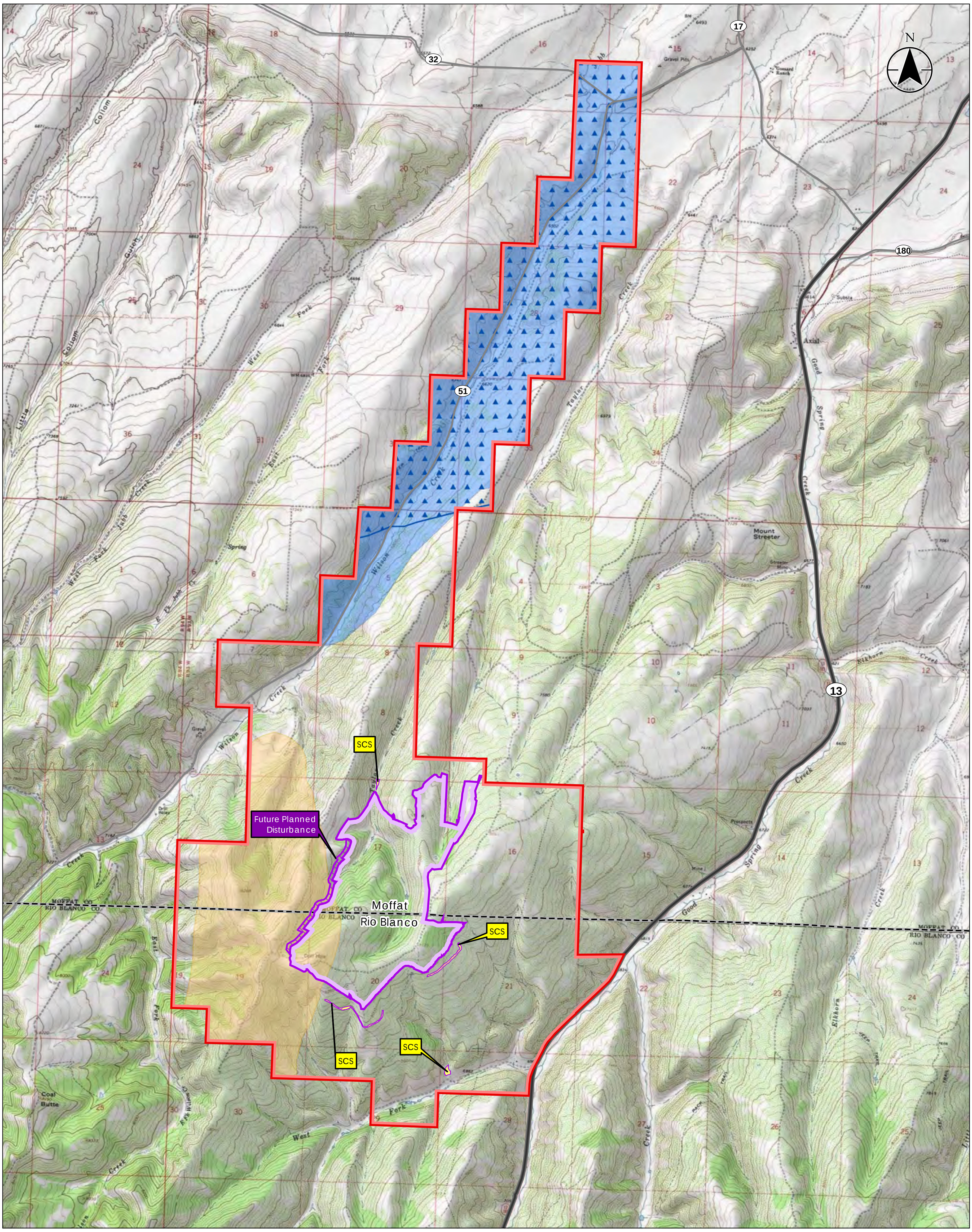
0 4,000 8,000 Feet
1:48,000 (At Original document size of 11x17)

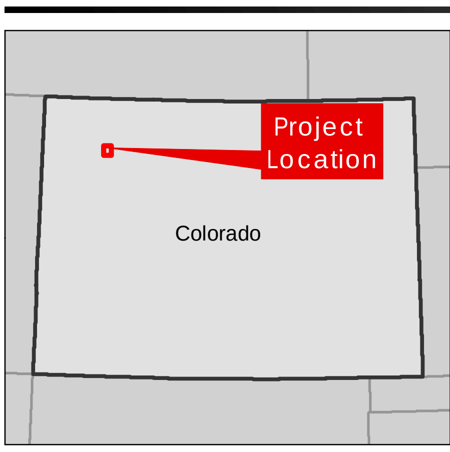
Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
3-7

Title
Big Game **Range**
Mule Deer and Pronghorn





Project Area

Future Planned Disturbance

Actual Disturbance since PR 02

Sediment Control Structure (SCS)

Elk Habitat

Elk Winter Concentration Area

Elk Severe Winter Range

Elk Production Area

County Road

Highway

County Boundary

0 4,000 8,000 Feet

1:48,000 (At Original document size of 11x17)

Notes

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Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.

3-8

Title

Big Game Range
Elk

3.8.3 Migratory Birds

The Migratory Bird Treaty Act (MBTA) (916 USC 703-711) provides protection for 1,007 species of native migratory birds. The Act makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations. The USFWS Birds of Conservation Concern (BCC) document lists a total of 24 species that are of the highest priority for the Northern Rockies and Southern Rockies/Colorado Plateau Bird Conservation Regions and that may occur in the Project Area (USFWS 2008). The purpose of the BCC list is to identify those species in greatest need of conservation action, outside of those species already listed by the USFWS as threatened or endangered. All 24 species on the BCC list have been, or could be, observed in or near the Project Area (**Table 3.8-1**).

Table 3.8-1 BCC Species that have the Potential to Occur in the Project Area

Common Name	Scientific Name	Habitat	Potential to Occur
American Bittern	*Botaurus lentiginosus*	Freshwater wetlands dominated by tall dense vegetation	Limited
Bald Eagle[1]	*Haliaeetus leucocephalus*	Breeds near reservoirs and rivers. Winters in semideserts and grasslands	Limited
Black Swift	*Cypseloides niger*	Cliffs, bare rock	Yes
Brewer's Sparrow[1]	*Spizella breweri*	Shrublands with average canopy cover over 1.5 meters	Yes
Brown-capped Rosy-finch	*Leucosticte australis*	Open areas, fields and brushy areas	Yes
Burrowing Owl[1]	*Athene cunicularia*	Grasslands with prairie dogs colonies or other fossorial mammals	Yes
Cassin's Finch	*Carpodacus cassinii*	Open coniferous forests and in deciduous woodlands	Limited
Ferruginous Hawk[1]	*Buteo regalis*	Grasslands, semi-desert shrublands	Yes
Fox Sparrow	*Passerella liaca*	Dense thickets in coniferous and mixed woodlands	Limited
Golden Eagle	*Aquila chrysaetos*	Open and semi-open prairies, sagebrush, and barren areas	Yes
Greater Sage-grouse[1]	*Centrocercus urophasianus*	Sagebrush	Yes
Juniper Titmouse	*Baeolophus ridgwayi*	Pinyon juniper woodlands	Limited
Lewis's Woodpecker	*Melanerpes lewis*	Open forests and woodland	Limited
Loggerhead Shrike	*Lanius ludovicianus*	Open areas with scattered trees and shrubs	Yes
Olive-sided Flycatcher	*Contopus cooperi*	Forests and woodland	Limited
Peregrine Falcon[1]	*Falco peregrinus*	Open spaces with cliffs and bluffs overlooking bodies of water	Yes
Pinyon Jay	*Gymnorhinus cyanocephalus*	Pinyon-juniper woodland	Limited
Prairie Falcon	*Falco mexicanus*	Open areas, steppe, plains, and prairies	Yes
Sage Thrasher	*Oreoscoptes montanus*	Sagebrush plains in arid and semi-arid areas	Yes

Common Name	Scientific Name	Habitat	Potential to Occur
Short-eared Owl	*Asio flammeus*	Winters communally in sheltered areas near feeding sites	Yes
Swainson's Hawk	*Buteo swainsoni*	Savanna, open woodlands, and cultivated lands	Yes
Veery	*Catharus fuscescens*	Swampy forests with shrubby understory	Limited
Williamson's Sapsucker	*Sphyrapicus thyroideus*	Middle to high elevation coniferous forests. Mixed deciduous-coniferous forests with aspen	Limited
Willow Flycatcher	*Empidonx traillii*	Thickets of willow associated with wet areas.	Limited

[1] Discussed in detail in **Section 3.9**

3.8.4 Raptors

Raptor surveys were conducted in the Project Area between 1984 and 1997 as well as 2006 through 2008. In those surveys, the following species were identified within or near the Project Area: Cooper's hawk (*Accipiter cooperii*), golden eagle, great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), prairie falcon, red-tailed hawk (*Buteo jamaicensis*), and turkey vulture (*Cathartes aura*). Other raptors that have the potential to occur include sharp-shinned hawk (*Accipiter striatus*), American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), and Swainson's hawk (Colowyo 2007 and 2013*a*).

Bald and golden eagles are protected under MBTA and the Bald and Golden Eagle Protection Act. CPW recommends no surface occupancy (beyond that which historically occurred in the area) within a ¼ mile (0.4 km) radius of active golden eagle nests. CPW also recommends seasonal restriction to human encroachment within a ½ mile (0.8 km) radius of active bald eagle nests from October 15 through July 31 and from December 15 through July 15 for active golden eagle nests. While no nesting habitat for these species occurs within the Project Area, both bald and golden eagles may forage in the area.

Nesting habitat for raptors is present throughout the Project Area and surrounding area. The most common areas for raptor nesting occur in rocky outcrops and trees along the drainages in the area. Additionally, the aspen forests located south of the Project Area represent suitable nesting habitat for raptor species. The majority of the Project Area is classified as sagebrush or mountain shrub vegetation communities. These areas are likely used as foraging areas for the various raptor species. The number of occupied raptor nests within the entire Colowyo Mine boundary have ranged between six in 2007 (Cooper's hawk, golden eagle, and red-tailed hawk) to 12 in 2006 (Cooper's hawk, golden eagle, great horned owl, long-eared owl, red-tailed hawk, and turkey vulture). The number of unoccupied nests have ranged between 56 (2007) and 80 (2008) (Cedar Creek 2011). A total of 10 nests have been identified within the Project Area and include three Cooper's hawks (two active, one inactive) and three red-tail nests (all active) and four unknown/inactive nests (Colowyo 2007).

3.8.5 Reptiles and Amphibians

The Project Area and surrounding area have an estimated seven reptile and four amphibian species that may be present. Common reptiles that may be found include the northern sagebrush lizard (*Sceloporus graciosus*), wandering garter snake (*Thamnophis elegalas vagrans*), and western rattlesnake (*Crotalus oreganus*). Amphibian species that have the potential to occur include the boreal chorus frog (*Pseudacris triseriat maculata*) and the northern leopard frog (*Rana pipiens*) (Colowyo 2007).

3.8.6 Fish

Within the Project Area, the only perennially flowing stream is Wilson Creek. Forming the boundary of the Project Area, Good Spring Creek, which is also perennial, is located to the southeast along State Highway 13. Good Spring Creek has been identified by CPW as a non-fishery stream although it is assumed that species such as black bullheads (*Ameiurus melas*), creek chubs (*Semotilus atromaculatus*), flannelmouth (*Catostomus latipinnis*), white suckers (*Catostomus commersonii*), flathead minnows (*Pimephales promelas*), and red shiners (*Cyprinella lutrensis*) are likely to be present. While Wilson Creek has not been classified by CPW, it is assumed that it contains similar species as Good Spring Creek (Colowyo 2007 and 2012*a*). The Yampa River is located approximately 7 miles (11 km) north of the mine boundary. Fish present in the Yampa River are discussed in **Section 3.9.1**.

3.9 SPECIAL STATUS SPECIES

Several sources of information were searched to identify sensitive species that have the potential to occur in the Project Area: the USFWS Federally Listed Endangered Species for Colorado (USFWS 2015) for federally listed species, Colorado Natural Heritage Program's (CNHP) Species Tracking Lists (CNHP 2015) for state and BLM sensitive species, consultations with local BLM and CPW resource specialists, and the Biological Assessment and resulting Biological Opinion for PR02 as approved in 2007. **Table 3.9-1** lists the federal, state, and BLM sensitive species that are recorded for Moffat and Rio Blanco counties.

Table 3.9-1 Federal, State, and BLM Sensitive Species in Moffat and Rio Blanco Counties

Group	Common Name	Scientific Name	Federal Status	State Status	BLM Sensitive
Amphibians	Boreal toad	*Anaxyrus boreas*		SE	Yes
	Northern leopard frog	*Lithobates pipiens*		SC	Yes
	Great Basin spadefoot	*Spea intermontana*			Yes
Birds	Mexican spotted owl[1]	*Strix occidentalis*	Threatened	*SE*	
	Yellow-billed cuckoo[1]	*Coccyzus americanus*	Threatened	*SC*	
	Ferruginous hawk	*Buteo regalis*		SC	Yes
	Greater sage-grouse	*Centrocercus urophasianus*	Candidate	SC	Yes

Group	Common Name	Scientific Name	Federal Status	State Status	BLM Sensitive
Birds	Mountain plover	*Charadrius montanus*		SC	Yes
	Greater sandhill crane	*Grus canadensis tabida*		SC	
	Bald eagle[1, 2]	*Haliaeetus leucocephalus*		SC	Yes
	Long-billed curlew	*Numenius americanus*		SC	Yes
	Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*		SC	Yes
	Northern Goshawk	*Accipter gentilis*			Yes
	Burrowing owl	*Athene cunicularia*		*ST*	Yes
	American Peregrine Falcon	*Falco peregrinus anatum*		*SC*	Yes
	White faced ibis	*Plegadis chihi*			Yes
	American white pelican	*Pelecanus erythrorhynchos*			Yes
	Brewer's sparrow	*Spizella berweri*			Yes
Fish	Bonytail[1]	*Gila elegans*	Endangered	*SE*	
	Humpback chub[1]	*Gila cypha*	Endangered	ST	
	Roundtail chub	*Gila robusta*		SC	Yes
	Colorado River cutthroat trout	*Oncorhynchus clarkii pleuriticus*		SC	Yes
	Colorado pikeminnow[1]	*Ptychocheilus lucius*	Endangered	ST	
	Razorback sucker[1]	*Xyrauchen texanus*	Endangered	SE	
	Bluehead sucker	*Catostomus discobolus*			Yes
	Flannelmouth sucker	*Catostomas latipinnis*			Yes
	Mountain sucker	*Catostomas platyrhychus*		*SC*	Yes
Mammals	Canada lynx[1]	*Lynx canadensis*	Threatened	*SE*	
	White-tailed prairie dog	*Cynomys leucurus*			Yes
	Spotted bat	*Euderma maculatum*			Yes
	Swift Fox	*Vulpes velox*		SC	Yes
	Black-footed ferret	*Mustela nigrips*	Endangered	SE	
Plants	Ute Ladies'-tresses	*Spiranthes Diluvalis*	Threatened		
	Dudley Bluffs bladderpod[1, 2]	*Lesquerella congesta*			
	Graham beardtongue[1, 2]	*Penstemon Grahamii*			

Group	Common Name	Scientific Name	Federal Status	State Status	BLM Sensitive
Plants	White River beardtongue[1, 2]	*Penstemon scariosus var albifluvis*			

SE - State endangered
ST - State threatened
SC - State species of concern
[1] Previously consulted under Section 7 of the ESA
[2] Listed under ESA in 2006 but has since been removed from the ESA.

3.9.1 Threatened, Endangered, and Candidate Species

As required by Section 7 of the ESA, OSMRE conducted formal consultation with the USFWS on August 26, 2006 to determine the potential effects of the Project on threatened and endangered species. The resulting Biological Opinion from the USFWS issued on November 6, 2006 (**Appendix D)** stated that the Proposed Action would have no effect on the following species: black-footed ferret, Mexican spotted owl, Dudley Bluffs bladderpod, Dudley Bluffs twinpod, western yellow-billed cuckoo, Graham beardtongue and the White River beardtongue. No circumstances have changed regarding PR02 that would alter these conclusions; as such, these species will not be discussed further *with the exception of the yellow-billed cuckoo*. The *2007* Biological Opinion also stated that the project may affect but would not adversely affect the Canada lynx and bald eagle. Additionally, the Graham beardtongue, White River beardtongue and bald eagle have been removed from the ESA list between *2007* and 2015. The Ute ladies-tresses was added to the list during the same time period as a threatened species and the greater sage-grouse (GSG) *was added* as a candidate *species*. While the lynx was originally included in consultation, it is no longer included on the USFWS list of species in the area. Therefore, it is not included in this discussion. Re-initiation of Section 7 consultation with the USFWS has been *completed* and includes the *Colorado River fish species, the* Ute ladies'-tresses, which was not listed at the time of the previous consultation*, and the western yellow-billed cuckoo.*

3.9.1.1 Colorado River Fish

Four species of fish listed as endangered under the ESA are commonly referred to as the Colorado River fish and include the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail. They are historically found in the Colorado River and its tributaries, including the Yampa River. Information on these four species is summarized from the biological assessment completed for PR02 in 2006 *with a final biological opinion issued in 2007,* and from the formal consultation conducted in 2012 *for the Collom expansion area* submitted in PR03 (OSMRE 2006 and 2012).

The Colorado pikeminnow is endemic to the Colorado River basin, where it was once widespread and abundant in warm-water rivers and tributaries. Wild populations of Colorado pikeminnow are now found only in the upper basin of the Colorado River (above Lake Powell). Three wild populations of Colorado pikeminnow are found in 1,090 miles (1,754 km) of riverine habitat in the Green River, upper Colorado River, and San Juan River subbasins. It thrives in swift flowing muddy rivers with quiet, warm backwaters and is primarily piscivorous, but smaller individuals also eat insects and other invertebrates. These fish spawn between late

June and early September and when they are five to six years old and at least 16 inches long. Spawning occurs over riffle areas with gravel or cobble substrate. The eggs are randomly splayed onto the bottom and usually hatch in less than one week.

The razorback sucker is found in deep clear to turbid waters of large rivers and some reservoirs over mud, sand, or gravel, and like most suckers, feeds on both plant and animal matter. Razorback suckers can spawn as early as age three or four, when they are 14 or more inches long. Breeding males turn black up the lateral line, with brilliant orange extending across the belly. Depending on water temperature, spawning can take place as early as November or as late as June. In the upper Colorado River basin, razorbacks typically spawn between mid-April and mid-June.

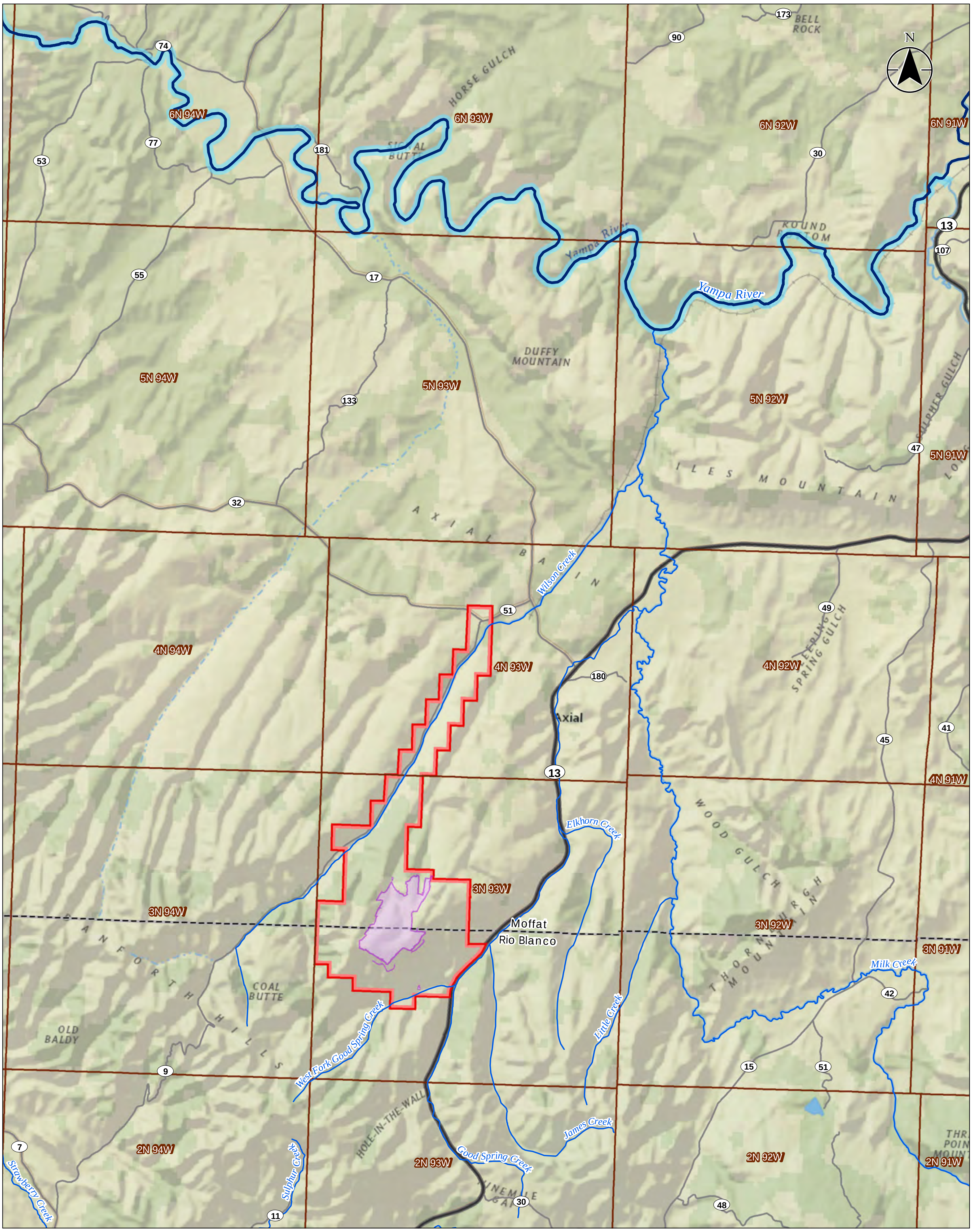
Adult humpback chubs are dark on top and light below and fins may have yellow-orange pigment near the base. Adults usually range from 12 to 16 inches long and weigh 0.75 to 2 pounds. This species historically occurred in the mainstream Colorado River in slower eddies and pools downstream below Hoover Dam; however, present populations are restricted to areas in, and upstream, of the Grand Canyon.

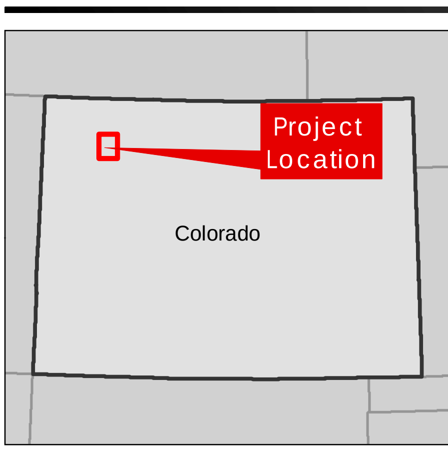
The bonytail is a highly streamlined fish often appearing dark in clear water and pale in more turbid waters. It prefers eddies and pools and is not often found in swift currents. Adults of seven years of age can reach 14 inches long and weigh more than one pound. Found historically throughout the Colorado River drainage, in recent years bonytails have only been taken from the Green River in Utah and lakes Havasu and Mohave.

*The nearest c*ritical habitat for the four Colorado River fish species is found within the Yampa River (**Figure 3-9**).

In relation to the Project Area, critical habitat for the Colorado pikeminnow occurs approximately 11 miles (18 km) north. For the razorback sucker, critical habitat is 30 miles (48 km) northwest of the Project Area. For the bonytail and humpback chub, critical habitat is designated within Dinosaur National Monument 37 miles (60 km) northwest of the Project Area. These species do not and are not likely to occur within the Project Area given the lack of suitable habitat (i.e., perennial rivers or streams).

A Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin was initialed on January 22, 1988. The Recovery Program was intended to be the reasonable and prudent alternative for individual projects to avoid the likelihood of jeopardy to the endangered fishes from impacts of depletions to the Upper Colorado River Basin. In order to further define and clarify the process in the Recovery Program, a Section 7 agreement was implemented on October 15, 1993 by the Recovery Program participants. Incorporated into this agreement is a Recovery Implementation Program Recovery Action Plan (RIPRAP) which identifies actions currently believed to be required to recover the endangered fishes in the most expeditious manner.





- River
- Stream
- Project Area
- Actual Disturbance since PR 02
- Colorado River Fish Habitat
- County Road
- Highway
- Township Boundary
- County Boundary

0 2 4 Miles

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Notes
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Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
3-9

Title
Colorado River Fish Habitat

On January 10, 2005, the USFWS issued a final programmatic biological opinion (PBO) on the *Management Plan for Endangered Fishes* in t*he Yampa River Basin*[9] (USFWS 2005). The USFWS has determined that projects that fit under the umbrella of the Yampa River PBO would avoid the likelihood of jeopardy and/or adverse modification of critical habitat for depletion impacts (USFWS 2005). The Yampa River PBO states that in order for actions to fall within the umbrella of the PBO and rely on the RIPRAP to offset its depletion, the following criteria must be met.

1. A Recovery Agreement must be offered and signed prior to conclusion of Section 7 consultation.
2. A fee to fund recovery actions will be submitted as described in the proposed action for new depletion projects greater than 100 acre-feet/year. The 2007 fee is $17.24 per acre-foot and is adjusted each year for inflation.
3. Re-initiation stipulations will be included in all individual consultations under the umbrella of this programmatic.
4. USFWS and project proponents will request that discretionary federal control be retained for all consultations under this programmatic.

3.9.1.2 Greater Sage-Grouse

The GSG is the largest grouse in North America. Males often weigh in excess of four to five pounds and hens weigh two to three pounds. Immature birds (less than one year) can be distinguished from adults by their light yellowish green toes (adults have dark green toes). The birds are found at elevations ranging between 4,000 feet to over 9,000 feet and are highly dependent on sagebrush for cover and food.

The largest number of GSG in Colorado occurs in the northwestern portion of the state, with Moffat County supporting the majority of breeding populations within the region (Northwest Colorado Greater Sage-Grouse Working Group [GSGWG] 2008). The population in northwest Colorado exhibited an increasing population trend from 1997 to 2005*; however, from 2007 to 2010 the population was generally steady with some slight declines in numbers at some leks. Despite this small regional decline*, populations in Colorado have been generally increasing for the past 17 years and breeding populations have not declined for the last 39 years (BLM 2015). GSG use of reclaimed mine areas in Colorado has been slow to develop because of the species reliance on big sagebrush, which can be difficult to establish through reclamation efforts (GSGWG 2008).

Within the Project Area there is 156.9 acres of GSG brooding habitat (2.2 percent of the Project Area), 955.4 acres of winter habitat (13.4 percent of the Project Area), and 5,424.0 acres of production habitat (76.2 percent of the Project Area) (CPW 2008). In addition to these habitat designations, approximately 655.1 acres of the Project Area (9.2 percent) has been designated as Priority Habitat Management Area (PHMA) and 4,776.6 acres (65.4 percent) is designated as General Habitat Management Area (GHMA) (**Figure 3-10**) (CPW 2011). PHMA areas are defined as "areas that have been identified as having the highest conservation

[9] http://www.coloradoriverrecovery.org/documents-publications/technical-reports/isf/yampa/YampaPlan.pdf

value to maintaining sustainable GSG populations; including, breeding, late brood-rearing and winter concentrations areas." GHMA areas are defined as, "areas of seasonal or year-round habitat outside of priority habitat" (BLM 2011). It should be noted that at the time of the originally submittal and approval of PR02, PHMA and GHMA were not mapped for GSG.

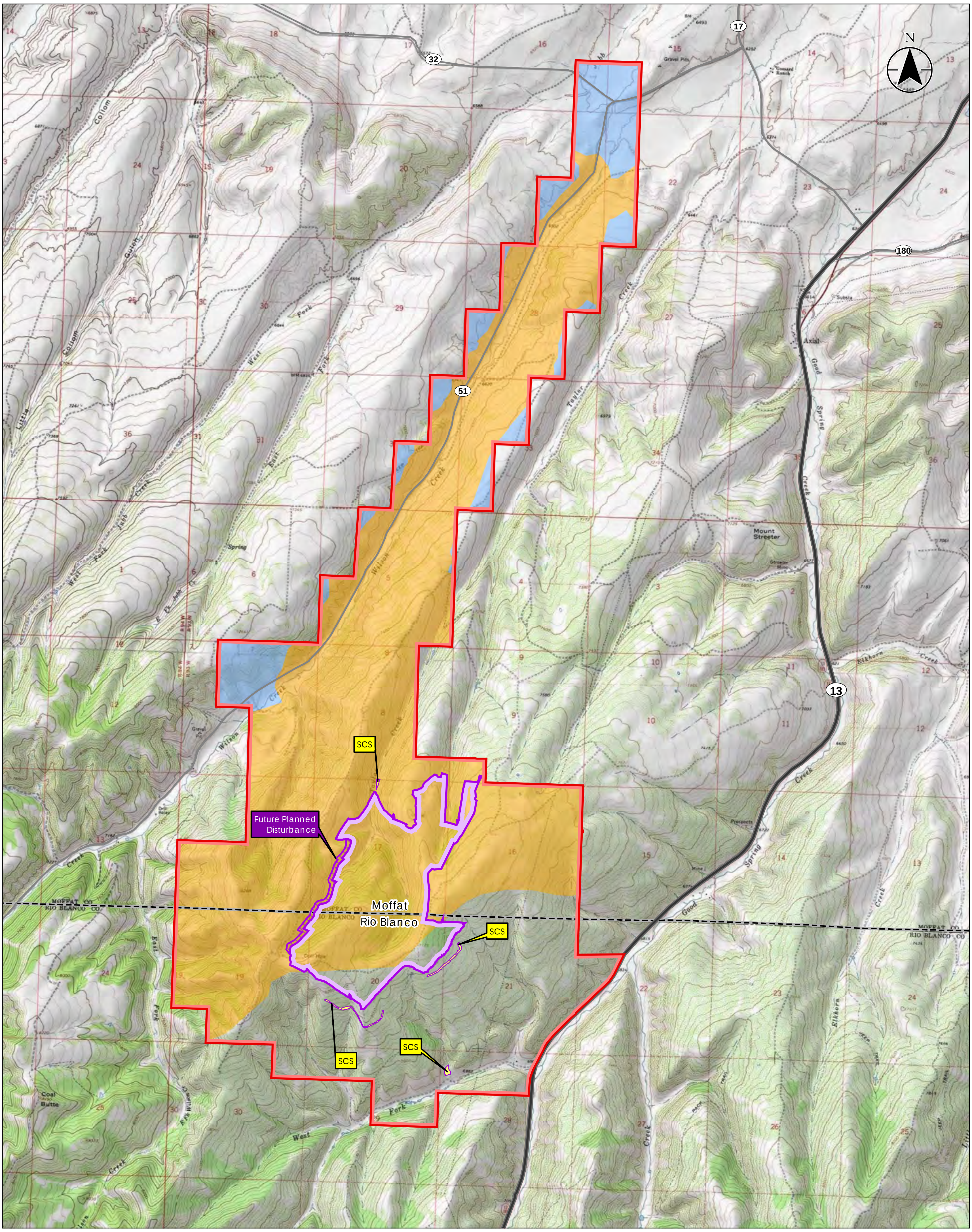
While no leks occur within the Project Area, a total of seven GSG leks have been documented within 4 miles (6 km) of the Project Area. Of these seven, four are located within the current mine permit boundary (leks SG1, SG3, SG4, and SG7) and three are outside the boundary (leks SG5, SG12, and Morgan 3). *However, none of these leks occur within the PR02 permit boundary.* In 2014, four of the leks were active (i.e., at least one GSG present within the last five years) and three were inactive. **Table 3.9-2** depicts the seven leks, their distance (in miles) to the Project Area, and their status between 2010 and 2014 (survey years).

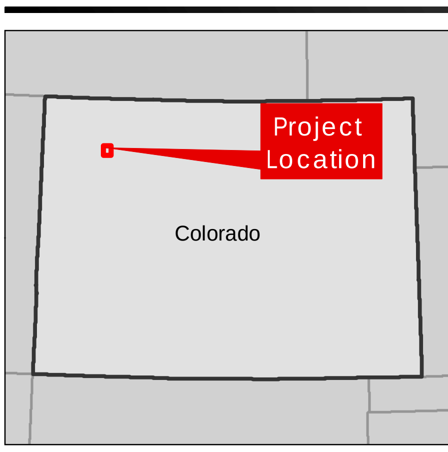
Table 3.9-2 GSG Lek Counts Near the Project Area

Lek Name	Distance to Project Area (miles)	Males 2010	Males 2011	Males 2012	Males 2013	Males 2014
SG1	0.2	0	0	0	0	No Count
SG3	2.1	0	0	0	0	0
SG4	2.8	9	15	27	26	39
SG7	3.7	5	4	0	0	5
SG5/Axial Basin	1.5	0	0	0	0	0
SG12/Gossard	1.7	3	4	0	0	12
Morgan 3	2.7	5	7	1	8	51

Source: CPW 2013 and *K. McKinstry, personal communication*, July 31, 2014.

The Project Area and the Colowyo Mine as a whole are located within the Axial Basin population of GSG. This population is one of the most studied populations within Colorado. From 2001 to 2008 a number of studies were conducted in the Axial Basin. These studies followed up to 280 radio-collared GSG to determine their locations and habitat use. Analysis of these data showed that GSG occur primarily north and west of the Project Area and west of County Road 51 and do not generally use the area in or around the Project Area (CPW, personal communication, February 20, 2014).





Project Area

Future Planned Disturbance

Actual Disturbance since PR 02

Sediment Control Structure (SCS)

Sage-Grouse Habitat

General Habitat Management Area (GHMA)

Priority Habitat Management Area (PHMA)

County Road

Highway

County Boundary

0 4,000 8,000 Feet

1:48,000 (At Original document size of 11x17)

Notes
1: Coordinate System: NAD 1983 UTM Zone 13N
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Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
3-10

Title
Greater Sage-Grouse Habitat

3.9.1.3 Ute Ladies'-tresses

The Ute ladies'-tresses orchid is a perennial, terrestrial orchid with stems 8 to 20 inches tall, arising from tuberously thickened roots. It blooms from late July through August.

Habitat for the Ute ladies'-tresses has expanded since the 1992 listing, which includes moist meadows associated with perennial stream terraces, floodplains, and oxbows at elevations between 4,300 to 6,850 feet; seasonally flooded river terraces, sub-irrigated or spring-fed abandoned stream channels and valleys, and lakeshores; and areas along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, roadside barrow pits, reservoirs, and other human-modified wetlands. Over one-third of all known Ute ladies'-tresses populations are found on alluvial banks, point bars, floodplains, or ox-bows associated with perennial streams.

Colorado populations of Ute ladies'-tresses orchids may be found within north-central and central Colorado and the upper Colorado River basin, particularly in the Uinta Basin. There are no known populations of this species occurring within or near the Project Area. The nearest known population is located in northwestern Moffat County, approximately 70 miles (113 km) from the mine.

Due to the lack of suitable habitat in the Project Area and the distance to the nearest known population, this species will not be discussed further.

3.9.1.4 Western Yellow-billed Cuckoo

The western yellow-billed cuckoo is a medium-sized bird about 12 inches (30 cm) in length, and weighing about 2 ounces (57 grams [g]). The species has a slender, long-tailed profile, with a fairly stout and slightly downcurved bill, which is blue-black with yellow on the basal half of the lower mandible. Plumage is grayish-brown above and white below, with rufous primary flight feathers (USFWS 2011a).

Western yellow-billed cuckoos breed in large blocks of riparian habitats, particularly woodlands with cottonwoods (Populus fremontii) and willows (Salix spp.). Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat in areas where the species has been studied in California. In the Lower Colorado River, this species occupies riparian areas that have higher canopies, denser cover in the upper layers of the canopy, and sparser shrub layers when compared to unoccupied sites. Although this species is generally associated with breeding and nesting in large wooded riparian areas dominated by cottonwood trees, they have been documented nesting in salt cedar between Albuquerque and Elephant Butte Reservoir and along the Pecos River in southeastern New Mexico. At the landscape level, the amount of cottonwood-willow-dominated vegetation cover in the landscape and the width of riparian habitat appeared to influence cuckoo distribution and abundance (USFWS 2011a).

Nesting sites are generally selected in locations near water. Clutch size is usually two or three eggs, and development of the young is very rapid, with a breeding cycle of 17 days from egg-laying to fledging of young. Although yellow-billed cuckoos usually raise their own young, they are facultative brood parasites, occasionally laying eggs in the nests of other yellow-billed cuckoos or of other bird species (USFWS 2011a). Currently it is not known if yellow-billed cuckoos show breeding site fidelity. In some instances, individuals in Arizona and California returned to the same sites in successive years.

Conversely, dramatic fluctuations in breeding pair numbers at long-term study sites indicate that pairs of cuckoos will use different breeding areas (78 FR 61621).

Diet of this species consists of caterpillars, lepidopterans, and is often supplemented with beetles, ants, and spiders. They also take advantage of the annual outbreaks of cicadas, katydids, and crickets, and will forage for small frogs and lizards. In summer and fall, cuckoos forage on small wild fruits, including elderberries, blackberries, and wild grapes. In winter, fruit and seeds become a larger part of the diet.

On October 3, 2014, the Western U.S. Distinct Population Segment of yellow-billed cuckoo was formally listed as a threatened species under the ESA (79 FR 59991). To date, the last known sighting of the cuckoo along the Yampa River occurred in 2008 and was within the proposed critical habitat. No information is available to indicate if the birds observed were nesting in the area or in the process of migration (C. Clayton, personal communication, July 28, 2015).

Critical habitat for the yellow-billed cuckoo was proposed in 2014 and includes a portion of the riparian area around the Yampa River between Craig, CO and Hayden, CO (79 FR 48548). The critical habitat is located approximately 16 miles (26 km) northeast of the Colowyo Mine and 1.3 miles (2 km) north of the Craig Generating Station.

3.9.2 State Listed and BLM Sensitive Species

Colorado state species of concern are those species identified by CPW as declining or appear to be in need of conservation. BLM sensitive species are those species that require special management consideration to avoid potential future listing under the ESA.

3.9.2.1 Boreal Toad

The boreal toad is a state-endangered amphibian species that is typically found in spruce-fir and aspen forests. Within these habitats, breeding is restricted to beaver ponds, lakes, streams, marshes, wet meadows, and bogs with sunny exposure and shallow water (BLM 2006). Given the lack of suitable habitat within the Project Area and lack of reported sightings in the area, it is unlikely that this species would occur. Therefore, it will not be discussed further.

3.9.2.2 Northern Leopard Frog

The northern leopard frog is a state species of special concern as well as listed by the BLM as a sensitive species. This species is found in heavily vegetated areas in a variety of aquatic habitats, including wet meadows, banks and shallows of marshes, ponds, lakes, reservoirs, streams and irrigation ditches (BLM 2006). Given the lack of suitable habitat within the Project Area and the lack of reported sightings, it is unlikely that this would occur. Therefore, it will not be discussed further.

3.9.2.3 Great Basin Spadefoot

This species is listed by the BLM as sensitive. It is found in pinyon-juniper woodlands, sagebrush flats, and semidesert shrublands. It commonly uses the bottom of rocky canyons, broad dry basins, and stream floodplains (BLM 2006). This species has the potential to occur within the Project Area, based on the habitat types that are found within the Project Area; however, there have been no reported sightings in the Project Area.

3.9.2.4 Ferruginous Hawk

Ferruginous hawks are listed as a species of concern in Colorado as well as a BLM sensitive species. It breeds in grasslands, semidesert shrublands, and the ecotone between shrublands and pinyon-juniper woodlands. Nests are found on elevated sites, such as rock outcrops, power poles, or isolated trees. Winter concentrations are found around prairie dog towns (BLM 2006). While the CNHP lists this species as rare in Moffat and Rio Blanco counties, there is suitable habitat present within the Project Area for this species to occur. There have been no reported sightings in the Project Area.

3.9.2.5 Mountain Plover

The mountain plover is listed as a species of concern in Colorado as well as a BLM sensitive species. It breeds in short, sparse grasslands, rangeland, and agriculture fields, such as where grazed by livestock or prairie dogs (BLM 2006). Given the limited amount of this type of habitat in the Project Area, the probability for this species to occur is low. There have been no reported sightings in the Project Area.

3.9.2.6 Greater Sandhill Crane

This species is listed as a species of concern for Colorado. The greater sandhill crane breeds in marshes, wet grasslands, and near beaver ponds or natural ponds lined with willow or aspens. Migrating birds forage along mudflats on reservoirs, moist meadows, and agricultural areas (BLM 2006). Given the lack of suitable habitat within the Project Area, it is unlikely that this would occur. Therefore, it will not be discussed further.

3.9.2.7 Bald Eagle

The bald eagle was previously listed under the ESA but was delisted in 2007. It is currently listed as a species of concern in Colorado as well as a BLM sensitive species. The bald eagle breeds near reservoirs and rivers. In winter they may occur locally in semideserts and grasslands, especially near prairie dog colonies. It is unlikely that the bald eagle would occur in the Project Area; however, one pair was observed in 2005 near the Project Area (BLM 2006).

3.9.2.8 Long-billed Curlew

The long-billed curlew is currently listed as a species of concern for Colorado as well as a BLM sensitive species. It breeds in short, sparse grasslands, or more rarely in wheat fields or fallow fields. Most nesting occurs close to standing water. It may use shorelines, meadows, and fields during migration (BLM 2006). Given the lack of suitable habitat within the Project Area, it is unlikely that this would occur. Therefore, it will not be discussed further.

3.9.2.9 Columbian Sharp-tailed Grouse

The Columbian sharp-tailed grouse is currently listed as a species of concern for Colorado as well as a BLM sensitive species. It is found where deciduous shrubs (Gamble oak and serviceberry) are interspersed with bunch grasses, sagebrush, aspen, irrigated meadows, wheat fields, or alfalfa fields. Display grounds are on knolls or ridges (BLM 2006). This species is known to occur within the Project Area although no leks are known to occur within the

Project Area. However, six leks are located within 1.25 miles (2 km) of the Project Area boundary (**Table 3.9-3**). In addition to known lek locations, the entire Project Area is mapped as Columbian sharp-tail grouse range. There is also approximately 1,357.6 acres of production habitat and 3,713.2 acres of winter range for this species within the Project Area (19.1 and 52.2 percent of the Project Area, respectively).

Table 3.9-3 Columbian Sharp-tailed Grouse Lek Counts in the Vicinity of the Project Area

Lek Name	Distance to Project Area (Miles)	2006 Male Count	2007 Male Count	2008 Male Count	2011 Male Count
Jubb	1.1	Inactive	Inactive	Inactive	Inactive
Jubb 2	1.0	11	7	1	Inactive
Jubb 3	1.0	No Count	No Count	No Count	10+
Jubb 4	0.9	No Count	No Count	No Count	5
Wilson	0.4	Inactive	Inactive	Inactive	Inactive
Wilson 2	0.3	12	7	11	31+

3.9.2.10 Northern Goshawk

The northern goshawk is currently listed as a BLM sensitive species. This species is found in boreal and temperate forests. Nesting tends to occur in mature coniferous forests in the West. This species is not likely to nest or forage in or near the Project Area due to the lack of forested areas. Therefore, this species will not be discussed further.

3.9.2.11 Burrowing Owl

The burrowing owl is currently listed as a BLM sensitive species and threatened in Colorado. This species is commonly found in prairie dog towns throughout Colorado. It requires either prairie dog, badger, or other fossorial mammal burrows for nesting. This species has the potential to occur within the Project Area; however, there have been no reported sightings in the Project Area.

3.9.2.12 American Peregrine Falcon

The peregrine falcon is a state species of concern as well as a BLM sensitive species. This species is found in open spaces associated with cliffs and bluffs overlooking rivers and open bodies of water. Habitat does exist and this species may occur; however, there have been no reported sightings in the Project Area.

3.9.2.13 White-faced Ibis

The white faced ibis is currently listed as a BLM sensitive species in Colorado. This species primarily inhabits freshwater wetlands, particularly cattail and bulrush marshes. It feeds in flooded hay meadows, agricultural fields and estuarine wetlands. Given the lack of suitable habitat within the Project Area, it is unlikely that this species would occur. Therefore, it will not be discussed further.

3.9.2.14 American White Pelican

The American white pelican is a BLM sensitive species in Colorado. This species is most commonly seen foraging at open bodies of water, shallow marshes, and rivers. While some suitable habitat exists in the vicinity of the Project Area, none actually occurs within the Project Area; therefore, it is unlikely that this species will occur in the Project Area, and will not be discussed further.

3.9.2.15 Brewer's Sparrow

The Brewer's sparrow is a BLM sensitive species in Colorado. It forages and nests in shrublands with an average canopy height greater than 1.5 meters. It is most commonly found in landscapes dominated by big sagebrush. Abundant habitat exists both within and in the vicinity of the Project Area; however, there have been no reported sightings in the Project Area.

3.9.2.16 Roundtail Chub

The roundtail chub is currently listed as a species of concern for Colorado as well as a BLM sensitive species. It occurs in large rivers with quiet water adjacent to fast moving water. The largest populations are found in habitats with a wide range of annual flows (i.e. high peaks and low base flows) and high sediment loads (BLM 2006). This species may occur in Wilson Creek within the Project Area; however, there have been no reported sightings in the Project Area.

3.9.2.17 Colorado River Cutthroat Trout

The Colorado River cutthroat trout is a subspecies of cutthroat trout and is currently listed as a species of concern for Colorado as well as a BLM sensitive species. It is found in cool, clear water of high elevation streams and lakes (BLM 2006). While there is perennial water in the Project Area, none of the streams contain habitat for this species. Therefore, it will not be discussed further.

3.9.2.18 Bluehead Sucker, Flannelmouth Sucker, and Mountain Sucker

The bluehead, flannelmouth, and mountain suckers are all BLM sensitive species in Colorado, and the mountain sucker is a state species of concern. These species are found in the river basins of northwest Colorado including the Yampa and White River basins. They are typically found in rivers and streams with gravel, sand, and mud bottoms. These species may occur in Wilson Creek within the Project Area; however, there have been no reported sightings of these species in the Project Area.

3.9.2.19 Townsend's Big-eared Bat

The Townsend's big-eared bat is currently listed as a species of concern in Colorado as well as a BLM sensitive species. It roosts in mines, caves, and structures. It forages on insects over adjacent pinyon-juniper woodlands, open montane forests, and semidesert shrublands (BLM 2006). While the availability of roosting habitat is unknown in the Project Area, this species may forage in the area.

3.9.2.20 White-tailed Prairie Dog

The white-tailed prairie dog is a BLM sensitive species in Colorado. This species is found in open shrublands, semidesert grasslands, and mountain valleys in northwestern Colorado. This species is known to occur within the vicinity of the Project Area.

3.9.2.21 Swift Fox

The swift fox is listed as a BLM sensitive species in Colorado and a state species of concern. This species is most commonly found in shortgrass and midgrass prairies in eastern Colorado. Habitat for this species exists within and near the Project Area, although there are no known sightings of this species in the vicinity.

3.10 CULTURAL AND HISTORIC RESOURCES

Cultural resources are defined as any definite location of past human activity identifiable through field survey, historical documentation, and/or oral evidence. Cultural resources include archaeological or architectural sites, structures, or places, and places of traditional cultural or religious importance to specified groups whether or not represented by physical remains. Cultural resources have many values and provide data regarding past technologies, settlement patterns, subsistence strategies, and many other aspects of history.

The Project is considered an undertaking subject to compliance with Section 106 of the NHPA. The NHPA, as amended, and its implementing regulations (36 CFR 60 and 800) require that federal agencies take into account the effects of their undertakings on important archaeological and historic sites in the area of potential affect (APE). In the terminology of NHPA, important sites are those that are determined to be eligible to the National Register of Historic Places (NRHP). Some sites require more information to determine eligibility; therefore they are designated as unevaluated or "need data" sites. In the case of archaeological sites, this is usually provided through test excavation. "Needs data" sites are managed as though they are eligible for the NRHP until further evaluated. If these "need data" sites are to be affected by the undertaking, test excavation determines if salvage excavation is necessary or if no further work is needed.

Under NEPA, federal agencies have broad responsibilities to disclose the potential impacts of their activities on the environment, including cultural resources. NEPA requires federal agencies to take into account cultural resources, including evaluation of potential impacts and mitigation measures, during the environmental analysis process. Regulations allow federal agencies to comply with Section 106 of NHPA through the use of the NEPA process and documentation, so long as the steps and standards of Section 800.8(c) of the Advisory Council on Historic Preservation's (ACHP) regulations are met.

3.10.1 Cultural Context

The cultural history of northwestern Colorado is presented among several recent context studies. Reed and Metcalf's (1999) study of the Northern Colorado River Basin provides applicable prehistoric and historic overviews as compiled by Frederic J. Athearn (1982) and Michael B. Husband (1984). Recorded archaeological sites within the region date throughout the known time span of occupation by native peoples and document ways of life based on hunting and gathering along with some reliance on horticulture during more recent times. The oldest sites are over 11,000 radiocarbon years in age (BLM 2014). Site types include common lithic scatters and campsites. Lithic scatters are often denoted by a scattering of stone tools and stone debris from tool manufacture. Campsites often have such a scattering of stone artifacts but also have some evidence of habitation, such as fire hearths or, less commonly, tipi rings or pithouses. Among the less common kinds of sites are rock art sites, tool stone quarry sites, and burials.

Athearn (1982) presents a history of northwest Colorado in which he discusses various historical periods and themes, including: the fur trade, exploration, settlement, confrontation with native people, development of the livestock industry, mining, construction of railroads, etcetera. A document that discusses historical sites in Colorado in general and suggested research to better understand the historic era through archaeology is provided by Church et al. (2007).

Furthermore, a regional overview of cultural resources administered by the BLM LSFO has been completed (McDonald and Metcalf 2006), in addition to valuable contextual data provided by synthesis reports of archaeological investigations conducted for a series of large pipeline projects in the BLM LSFO management area (Metcalf and Reed 2011; Rhode et al. 2010; Reed and Metcalf 2009).

3.10.2 Project Specific Inventory

As required by the NHPA, intensive archeological field investigations have been conducted on the Project Area (TRC Mariah 2006; WAS 2014). However, within the northern portion of the Project Area, six relatively small areas have not been surveyed. These areas all consist of steeply sloping terrain, and were not surveyed as the likelihood of encountering sites on such terrain is low. The previous inventories within the Project Area recorded a total of 46 sites (TRI Mariah 2006; WAS 2014). Of the 46 sites, none are NRHP-eligible but 3 need more data to determine their NRHP eligibility (SHPO 2013). The majority (43) of the sites were recommended as not eligible for inclusion on the NRHP and need no further management. Only NRHP-eligible and "needs data" sites are carried forward in the analysis (**Section 4.10**).

3.11 INDIAN CONCERNS

On May 21, 2015, the following Indian tribes were formally contacted for the Project: Eastern Shoshone Tribe, Ute Mountain Ute Tribe, Ute Indian Tribe, and the Southern Ute Tribe. On June 16, 2015, a Project description and request for consultation letter was sent to the Colorado State Historic Preservation Office (SHPO). Previous consultation for PR02 occurred in 2007 during the original NEPA analysis (OSMRE 2007).

Within this area of Colorado, tribal consultations on a variety of project types have revealed several site types of concern. These include prehistoric and historic Indian rock art, eagle traps, vision quests, prehistoric cairns, and prehistoric trails. Consultation will be ongoing throughout the NEPA process.

3.12 SOCIOECONOMICS

The Project Area is located approximately 30 miles (48 km) southwest of Craig and 22 miles (35 km) north of Meeker. These communities in Moffat and Rio Blanco counties, respectively, are the most likely to be affected by mining in the Project Area. **Table 3.12-1** shows the populations of these communities; ethnic distribution is discussed in **Section 3.13**.

Table 3.12-1 Population Estimates

Community	2000 Census Estimate	2010 Census Estimate	2013 Estimate
Craig	9,189	9,464	8,981
Meeker	2,242	2,475	2,493

Source: Census 2013

Per capita income for the two communities has risen between 28.3 and 53.2 percent between 2000 and 2011 while throughout the State of Colorado it has risen 28.1 percent. The mean household income for the two communities has risen between 29.5 and 46.5 percent, compared to the state average of 30.1 percent between 2000 and 2010 (Census 2013). **Table 3.12-2** depicts the per capita income for the two communities and **Table 3.12-3** shows the mean household income. From 2008 to 2014, Colowyo contributed an average of $29 million per year to the local economy through gross wages, insurance premiums paid for employees, and retirement fund contributions (Tri-State 2015a).

Table 3.12-2 Per Capita Personal Income

Community	2000 Estimate	2011 Estimate	Percent Change
Craig	$18,140	$23,274	28.3%
Meeker	$17,647	$27,042	53.2%
State of Colorado	$24,049	$30,816	28.1%

Source: Census 2013

Table 3.12-3 Mean Household Income

Community	2000 Estimate	2011 Estimate	Percent Change
Craig	$45,846	$59,384	29.5%
Meeker	$40,496	$59,329	46.5%
State of Colorado	$59,313	$77,149	30.1%

Source: Census 2013

In 2010, the largest employment industries for the two communities were educational and health care service, mining and oil and gas extraction (9.4 and 20 percent for Craig and Meeker, respectively), retail trade, arts, entertainment, recreation, accommodation, and food services. For comparison, in Colorado the largest employment industries are educational services, health care, and social assistance (19.6 percent).

The unemployment rate for Moffat and Rio Blanco counties is 5.4 percent and 6.1 percent, respectively. The unemployment rate is slightly above the Colorado unemployment rate of 4.3 percent (BLS 2015).

Housing in the two communities is generally available. The housing market in the area has been on a steady growth cycle (**Table 3.12-4**).

Table 3.12-4 Housing Characteristics

Community	2000 Median Home Price	2010 Median Home Price	Percent Change	2000 Median Rent	2010 Median Rent	Percent Change
Craig	$101,900	*$160,100*	*57*	$450	*$739*	*64*
Meeker	$104,500	*$186,900*	*78*	$382	*$685*	*79*
State of Colorado	$166,600	*$236,600*	42	$671	$833	24

Source: Census (2003), American FactFinder (2015),

The top three private industry sectors by employment and income in Moffat County are mining, public administration, and retail trade (YVDP 2015). Colowyo Mine employs 220 people, of which, the large majority live in Moffat and Rio Blanco counties, mostly in the surrounding areas of Meeker and Craig. Tri-State pays over $25 million dollars in wages annually which get spent largely in Moffat and Rio Blanco counties (*EDCC* 2015).

Many businesses that directly or indirectly support Colowyo Mine in Moffat and Rio Blanco counties exist because of the mining industry and include welding, fabrication, and equipment rental businesses. Even tertiary businesses depend heavily on Colowyo, most notably the hotel and restaurant businesses in Meeker and Craig. This equates to annual purchases in northwestern Colorado (Moffat, Rio Blanco, and Routt counties) of $19,768.00 and regional purchases (northwestern Colorado and southwestern Wyoming) of $39,934,000 (Tri-State 2015a).

Nearly 350,000 tons of coal was produced in Moffat County in September 2013, a 19 percent decline in coal production from the previous September (YVDP 2015). The 12-month average for coal production in Moffat County was 340,000 tons, a decline from 2012 when the 12-month average production was 410,000 tons. According to the 2014-2015 Community Indicators Report, year-to-date coal production through November 2013 was down almost 20 percent in Moffat County and 31 percent statewide. Nationally, coal production for the first half of 2013 was roughly 21 million tons, down about 4 percent from the same period in 2012 (YVDP 2015).

Another study conducted in 2015, the Measurement of Economic Activity for Coal Industry and Electrical Power Generation Industry in the Yampa-White River Region of Northwest Colorado (EDCC 2015), summarizes the impact of the coal mining industry in Moffat County, Rio Blanco County, Routt County, and the Yampa-White River Region. The coal mining industry in the region directly employs 4.6 percent of the total employees and accounts for 17.4 percent of the region's direct output (EDCC 2015). Specifically, Moffat County's coal mining sector contributes about $229 million to the direct gross regional product (GRP) which is 31 percent of the $742 million GRP for the county. There are 776 direct employees in the industry, with total direct wages of about $61 million. The total impact of the coal mining industry in the county is 1,144 workers, $75 million in wages, and $283 million in output (EDCC 2015). Rio Blanco County's coal mining sector contributes slightly less than $55 million to the direct GRP or 14 percent of the $397 million for the county. There are 183 direct employees in the industry, with total direct wages greater than $14 million. The total impact of the coal mining industry in Rio Blanco County is 241 workers, $16 million in wages, and $61 million in output (EDCC 2015).

In 2014, Colowyo paid $1,402,538.11 in property taxes. Of that, $1,259,907.91 was paid to Moffat County, and $142,630.20 was paid to Rio Blanco County (Tri-State 2015a).

Federal coal lease royalty rates are 12.5 percent of the value of the coal removed from a surface mine (43 CFR 3473). Money collected through federal mineral leases and state severance taxes are distributed differently in Colorado. 51 percent of the federal mineral lease royalties are distributed to the federal government while 49 percent are returned to Colorado. Of the 49 percent returned to Colorado, 40 percent is used in the Local Impact Program managed by the Department of Local Affairs. That money is split between the local counties and a grant program that counties may apply for. From 2010 to 2014 the federal treasury collected an average of $9.5 million per year in royalties from Colowyo for the Project Area leases (Tri-State 2015a). Fifty percent of these royalties were returned to the State of Colorado for planning, construction, and maintenance of public facilities and services in the affected counties ($4.77 million per year).

Of the money collected through state severance taxes, 50 percent is distributed to the Department of Natural Resources' State Trust fund and 50 percent is distributed to the Department of Local Affairs Local Impact fund. The Local Impact fund money is used in grant programs as well as distributed back to local jurisdictions where the mining takes place. In 2014, Colowyo paid $1,285,287.39 in severance taxes (Tri-State 2015a).

3.13 ENVIRONMENTAL JUSTICE

Executive Order 12898 on Environmental Justice was issued on February 11, 1994. The purpose of the order is to identify and address, as appropriate, disproportionally high and adverse human health and environmental effects of programs, policies, or activities on minority populations, low-income populations, and indigenous peoples. Relevant census data for Moffat and Rio Blanco Counties were collected to determine whether populations residing in the counties that are in the vicinity of the Project Area constituted "environmental justice populations." According to the CEQ and EPA guidelines established to assist federal and state agencies, a minority population is present in a project area if:

- The minority population of the affected area exceeds 50 percent; or,
- The percentage of the minority population in the affected area is meaningfully greater than the percentage in the general population.

For Moffat County, 82.6 percent of the population is Caucasian, 14.1 percent is Hispanic or Latino, 1.4 percent is American Indian, 0.7 percent is Asian, and 0.5 percent is African American; the data for Rio Blanco County is nearly identical (Census 2015). This data indicates that there is not a minority population present in the Project Area that would be disproportionally affected by the Project.

The U.S. Census Bureau estimates poverty levels using a set of income thresholds that vary by family size and composition. If a household's income is below income thresholds, the family and all the individuals of that household are considered to be in poverty. Using this criterion, the Census Bureau provides estimates of the percentage of individuals that fall below the poverty level for each county in the United States. Within Moffat and Rio Blanco counties, the 2013 poverty rate was 11.5 and 10.7 percent, respectively. These are below the 12.9 percent poverty level for the State of Colorado (Census 2014). This data indicates that there is not a low-income population that would be disproportionally affected by the Project.

Because there are no environmental justice populations present, environmental justice will not be discussed further.

3.14 VISUAL

The BLM utilizes Visual Resource Management (VRM), which is a system to help identify visual (scenic) values and minimize visual impacts to landscape character of public lands. The VRM system process involves inventorying scenic values, establishing management objectives for those values, and evaluating proposed activities to analyze effects and develop mitigations to meet established VRM objectives (BLM 1986).

3.14.1 BLM Visual Resources Management

Visual Resource Inventory

A visual resource inventory (VRI) is a systematic process designed to determine the extent and quality of visual resources in a given area. The inventory provides a means to determine visual values on public lands. The inventory process consists of scenic quality evaluation, viewer sensitivity level analysis, and delineation of distance zones. Scenic quality is a measure of the visual appeal of a parcel of land. Sensitivity measures the level of public concern for scenic quality. Distance zones describe the relative visibility of an area in terms of foreground, middle ground, and background based on the relative proximity of the landscape to a viewer at a fixed point. Based on a combination of these three categories, BLM lands fall into one of four VRI classes. Areas with high scenic quality and visual sensitivity in the foreground or middle ground are classified the highest. As scenic quality and/or sensitivity decline, and/or views are at a greater distance (in the background or seldom seen areas), areas are classified lower (BLM 1986).

VRM Classes

VRM Classes are assigned to lands during the land use planning process by considering the VRI for an area in conjunction with the present and/or planned future use of an area. VRM class objectives define the level of change in the visual quality of the landscape that the management of an area would allow for. VRM class objectives are defined as follows:

- ***Class I Objective***: To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
- ***Class II Objective***: To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.

- ***Class III Objective***: To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
- ***Class IV Objective***: To provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

The BLM LSFO ROD and RMP (BLM 2011) states that areas suitable for coal mining are generally classified as VRM Class IV.

3.14.2 Project Area Visual Resources

VRM Classes

The BLM LSFO ROD and RMP (BLM 2011) classified the BLM-managed public lands in the southern portion of the Project Area as VRM Class IV. A parcel of approximately 80 acres of BLM-managed public lands in the northern portion of the Project Area is designated VRM Class III.

Description of Visual Resources of the Project Area

The Project Area is an area of rolling hills and low mesas incised by streams. In drainage bottoms, the view is enclosed and vegetated with low grasses and shrubs in varying shades of greens, golds, greys, and browns with softer textures. Mesa slopes and hillsides are steep and sparsely vegetated with coarse darker green shrubs and grasses surrounding light tan to red rock outcrops in the foreground and middle ground. In areas where the view is more open and panoramic, low mesas are soft and slightly rounded in shades of light green and tan to brown, creating gently undulating lines at the skyline. Low mesas in the distance at the horizon are darker shades of green and brown to black. Visible man-made features are road surfaces.

Sensitive Viewers

Potential sensitive viewers of the Project would be travelers on roadways in the vicinity of the Project. Public access in the vicinity of the Project Area is via State Highway 13 east of the Project Area, Moffat County Road 51 west of the Project Area, and Moffat County Roads 17 and 32 north of the Project Area. Most of these access routes are located in drainage bottoms, which result in enclosed views and limited visibility of the surrounding landscape; but occasionally the landscape opens up to more panoramic views of the area. However, the Project Area is located on a mesa top at a higher elevation than viewers traveling on the roadways in the vicinity. Therefore, the Project Area is generally not visible from the roadways.

Other sensitive viewers in the area would be recreationists who travel off-road. For the most part these would be hunters who would be in locations at higher elevations where the Project would be visible. Hunters would be traveling into areas with views of the Project Area at specific times of the year during hunting season. Recreational use of public lands in the vicinity of the Project Area other than hunting would be possible, but likely infrequent.

3.15 RECREATION

The majority of the Project Area is private land. The dominant recreational activity in rural Moffat County, and the Project Area, is hunting. Camping and off-highway vehicle (OHV) uses are commonly associated with hunting. Hunting is primarily archery and rifle hunting for deer, pronghorn, and elk and shotgun hunting for birds and small mammals. In recent years, land owners adjacent to the Project Area have been leasing their lands to hunters in increasing numbers. This trend may continue on lands adjacent to the Project Area, but the possibility for recreation on the Project Area, as long as mining activities are on-going, is highly unlikely due to public safety concerns. Touring, photography, bird watching, and other more passive recreational pursuits are also popular but do not occur in the Project Area due to safety concerns.

Recreation on BLM administered lands is managed in accordance with the LSFO RMP (BLM 2011) which defines a variety of dispersed recreational activities in Moffat and Rio Blanco counties. In the LSFO RMP, two special recreation management areas (SRMAs) were identified within the BLM LSFO management area. Areas that are not designated as SRMAs are by default extensive recreation management areas (ERMAs), for which minimal capital investments are to be made. The Project Area and surrounding lands are designated as an ERMA where recreation use is dispersed and requires minimal management. OHV use is one of the fastest growing recreation activities on public lands (BLM 2011). In the LSRMP, OHV use on BLM land in the Project Area is limited to existing roads and trails.

Within the Colowyo Mine boundary and the Project Area, no *public* hunting is allowed. *However, Colowyo allows its employees and their families to hunt on certain parcels of land owned by Colowyo within the permit boundary. Employees may not hunt where active mining is occurring.* In general, publicly owned lands (i.e., BLM-administered federal lands and state school sections) are open to hunting if legal access is available. *However, w*ithin the Project Area, all BLM-administered parcels are surrounded by state lands or Colowyo-owned land with limited to no access available. Due to safety concerns, however, public surface lands contained within an active mining area are closed to *everyone*, further limiting recreational use.

3.16 PALEONTOLOGY

Paleontological resources comprise a fragile and nonrenewable scientific record of the history of life on earth. The Colorado State Paleontology Program Policy establishes guidelines for the management and protection of paleontological resources on public lands. Paleontological resources, such as fossil plant or animal remains, are discovered frequently in western U.S. coal mines where fresh, fossil-bearing rocks are exposed. Paleontological resources are integrally associated with the geologic rock units (e.g., formations) in which they are located. The Williams Fork Formation, where the Project Area is located, is rated by the State as having a high potential for discovery of fossils (Armstrong and Wolney 1989). Dinosaurs and other vertebrates, as well as fossil tracks and plants, have been found in the Williams Fork Formation.

The BLM has implemented a Potential Fossil Yield Classification (PFYC) system for classifying paleontological resources on public lands. Under the PFYC system, geologic units are classified from Class 1 to Class 5 based on the relative abundance of vertebrate fossils or uncommon invertebrate or plant fossils, and their sensitivity to adverse impacts. A higher classification number indicates a higher fossil yield potential and greater sensitivity to adverse impacts. The Project Area is located in the Cretaceous Williams Fork formation. The Project Area is classified as PFYC Class 5 (BLM 2011). The potential for abundant vertebrate fossils or scientifically significant invertebrate or plant fossils in the Project Area is high.

3.17 ACCESS AND TRANSPORTATION

Access to the Colowyo Mine and Project Area is generally from Craig in Moffat County to the north and Meeker in Rio Blanco County to the south. Both communities lie along State Highway 13 which serves as the primary road leading north and south between Craig and Meeker. Approximately 11 miles (18 km) north of the mine entrance (near Hamilton), the average annual daily traffic (AADT) count for State Highway 13 in 2013 was 1,800 vehicles. Of this, 330 vehicles (18.3 percent) were truck traffic. Approximately 20 miles (32 km) south of the mine entrance (near Meeker), the AADT count in 2013 was 1,700 vehicles, of which 290 vehicles (17.5 percent) were truck traffic (CDOT 2015). From State Highway 13, the Project Area is accessed by County Road 51. County Road 51 traverses through the Project Area in a northeast-southwest direction. County roads 17 and 32 access the north end of the Project Area from the north and northwest, respectively. State and county roads are usually constructed to higher standards than local or BLM roads and provide the primary arterial and collector road systems for access to and through private and BLM lands. While other roads lead into the mine from other directions along county roads, that access is through locked gates and generally does not account for a large amount of traffic. *Mine use of public roadways occurs primarily when shifts change at the mine. Administrative staff generally works from 7:30 am to 4 pm, maintenance staff work in two shifts from 7:00 am to 7:00 pm and 7:00 pm to 7:00 am, and production staff work in two shifts from 8:00 am to 8:00 pm and 8:00 pm to 8:00 am.*

Coal is currently transported from the mine (at the Gossard loadout) to coal markets by rail (**Figure 1-1**) in unit trains, i.e. "a railway train that transports a single commodity directly from producer to consumer" (Merriam-Webster 2015). At current production rates, coal is shipped on approximately 250 unit trains per year. The mine is connected to a main rail line via a private rail spur that connects to the coal load out facility at the mine and runs north to two east-west rail lines 80 miles (129 km) southeast of Craig in Eagle County. The mine's spur connects into the Moffat Tunnel line. Coal heading east of this intersection will pass through the Moffat Tunnel and deliver coal to the eastern slope of Colorado. Coal heading west of this intersection will join with a major east-west rail line that delivers coal throughout the country.

3.18 SOLID OR HAZARDOUS WASTE

No designated or illegal sites for solid or hazardous wastes have been identified within the Project Area. Field surveys that have been conducted have not identified any waste disposal practices that would cause deterioration of the environment.

As there is no coal preparation facility, no coal processing wastes are generated. Non-coal, nonhazardous solid waste, such as garbage, used tires, etc., is stored in a controlled manner around the operation in various waste receptacles and waste locations. Periodically the waste is disposed of in the backfill area of the pit and covered with a minimum 25 feet of overburden material. No waste is allowed on the bottom of the backfill area or below the anticipated groundwater level of backfilled areas. Nonhazardous used oil and grease, flammable liquids, etc. are stored in a tankfarm facility located near the shop facilities.

Colowyo's status as a conditionally exempt small quantity generator of hazardous materials essentially indicates that Colowyo generates negligible amounts of hazardous waste. Hazardous wastes produced by current mining activities at the mine are handled in compliance with regulations promulgated under the Resource Conservation and Recovery Act, Federal Water Pollution Control Act (CWA), Safe Drinking Water Act, Toxic Substances Control Act, Mine Safety and Health Act, Department of Transportation, and the CAA. Mining operations must also comply with all state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

3.19 NOISE

Noise is an unwanted sound occurrence. A noise's attributes (pitch, loudness, repetitiveness, vibration, variation, duration, and the inability to control the source) determine how it affects a receptor. To properly assess the noise resources for any area, consideration of the topography, climate, flora, and current ambient noise is required. The affected environment for noise impacts for wildlife is usually limited to a distance of 880 yards from the source based on current wildlife studies (Fletcher 1980). However, if residential housing has the potential to be impacted, the affected environment includes the distance from the source of the noise to the residence.

The unit of sound level measurement (i.e. volume) is the decibel (dB), expressed as dBA (decibel-A weighted). The A-weighted decibel measure is used to evaluate ambient noise levels and common noise sources. Sound measurements in dBA give greater emphasis to sound at the mid- and high- frequency levels, which are more discernible to humans. The decibel is a logarithmic measurement; thus, the sound energy increases by a factor of 10 for every 10 dBA increase.

Generally, natural noise levels will be around 35 dBA in rural areas away from communities and roads. Within a rural community, the man-made noise level ranges from 45 dBA to 52 dBA (Noise Effects Handbook 1998). The day-night sound level of residential areas should not exceed 55 dBA to protect against activity interference and annoyance (Noise Effects Handbook 1998). **Table 3.19-1** presents typical sound levels in dBA and subjective descriptions associated with various noise sources.

The Federal Noise Control Act of 1972 established a requirement that all federal agencies administer their programs to promote an environment free of noise that jeopardizes public health or welfare. Although the Occupational Safety and Health Administration (OSHA) have the most extensive regulations in regard to noise pollution, these standards are only for noise levels within the workplace.

Table 3.19-1 Sound Levels Associated With Ordinary Noise Sources

Noise Source	Noise Level	Subjective Description
Commercial Jet Take-Off	120 dBA	Deafening
Road Construction Jackhammer	100 dBA	Deafening
Busy Urban Street	90 dBA	Very loud
Standard For Hearing Protection 8-Hour Exposure Permissible Exposure Limit (PEL) Action Level within Active Mining Facilities	90 dBA 85 dBA	Very loud Loud - to very loud
Construction Equipment at 50 feet	80-75 dBA	Loud
Freeway Traffic at 50 feet	70 dBA	Loud
Noise Mitigation Level for Residential Areas Federal Housing Administration (FHA)	67 dBA	Loud
Normal Conversation at 6 feet	60 dBA	Moderate
Noise Mitigation Level for Undisturbed Lands (FHA)	57 dBA	Moderate
Typical Office (interior)	50 dBA	Moderate
Typical Residential (interior)	30 dBA	Faint

EPA identifies outdoor noise limits to protect against effects on public health and welfare by an equivalent sound level (Leq), which is an A-weighted average measure over a given time. Outdoor limits of 55 dBA Leq have been identified as desirable to protect against speech interference and sleep disturbance for residential areas and areas with educational and healthcare facilities. Sites are generally acceptable to most people if they are exposed to outdoor noise levels of 65 dBA Leq or less, potentially unacceptable if they are exposed to levels of 65 – 75 dBA Leq, and unacceptable if exposed to levels of 75 dBA Leq or greater (Noise Effects Handbook 1998). Mine Safety and Health Act (MSHA) regulations require a mine operator to assure that no miner is exposed during any work shift to noise that exceeds the permissible instantaneous exposure level of 115 dBA, or an 8 hour time-weighted average sound level (TWA_8) of 85 dBA (or equivalently a dose of 50 percent, integrating all sound levels from 80 dBA to at least 130 dBA) (30 CFR 62.130).

Ambient noise levels across the Project Area generally include natural sources such as wind, birds, and insects and noise associated with the active mining operation including blasting, coal loading/conveyance, crushing, and vehicle noise. Gun shots may be heard during hunting season or from target practice.

Noise generated from the active mining operations occurs from the operation of heavy trucks and machinery on a relatively constant basis (~90 dBA) including during nighttime hours. During blasting to open up coal resources, sound levels would raise to over 100 dBA. However, this only occurs on average of once per *day* and during the daytime. *There have not been any complaints about noise related to either the mine or the rail line from the local community (D. Lempke, personal communication, July 8, 2015).*

3.20 LIVESTOCK GRAZING

Public rangelands administered by the BLM are used for livestock grazing and wildlife habitat. The Project Area overlaps five grazing allotments: Taylor Creek, East Fork Wilson Creek, Smith-Crawford, Colowyo Commons, and Lower Taylor Creek. Animal unit months (AUMs) are assigned to each grazing allotment; AUMs are defined as the amount of forage required to support one cow and her calf (if under six months) or five sheep and their lambs (if under six months) for one month. Within these five allotments there are 188 AUMs available for cattle forage and 45 AUMs available for sheep forage in the Project Area (**Table 3.20-1**). Grazing management must adhere to the BLM's Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado (BLM 1995). Colowyo is the grazing leaseholder and subleases the grazing rights to a third party.

Table 3.20-1 Grazing Allotments

Allotment	Total Acres	Acres in Project Area	Total AUMs Cattle/Sheep	AUMs in Project Area Cattle/Sheep
Taylor Creek	8,419	5,490	170/43	111/28
East Fork Wilson Creek	1,019	382	170/43	63/16
Smith-Crawford	22,903	176	1,219/0	9/0
Colowyo Commons	35,572	173	347/173	2/1
Lower Taylor Creek	762	78	27/0	3/0
Totals	**68,675**	**6,299**	**1,933/259**	**188/45**

Source: BLM Geocommunicator database

Taylor Creek

There are 111 AUMs of forage available for cattle use generally from June 25 through October 20 in the Project Area within the Taylor Creek Allotment; period of use varies according to pasture. There are 28 AUMs of forage available for sheep use from June 5 through July 5.

East Fork Wilson Creek

There are 63 AUMs of forage available for cattle use generally from June 25 through October 20 in the Project Area within the East Fork Wilson Creek Allotment; period of use varies according to pasture. There are 16 AUMs of forage available for sheep use from June 5 through July 5.

Smith-Crawford

There are 9 AUMs of forage available for cattle use generally from May 15 through November 15 in the Project Area within the Smith-Crawford Allotment; period of use varies according to pasture. There is no sheep grazing on this allotment.

Colowyo Commons

There are 2 AUMs of forage available for cattle use from May 1 through October 31 in the Project Area within the Colowyo Commons Allotment. There is 1 AUM of forage available for sheep use from June 1 through October 31.

Lower Taylor Creek

There are 3 AUMs of forage available for cattle use from May 1 through October 14 in the Project Area within the Lower Taylor Creek Allotment. There is no sheep grazing on this allotment.

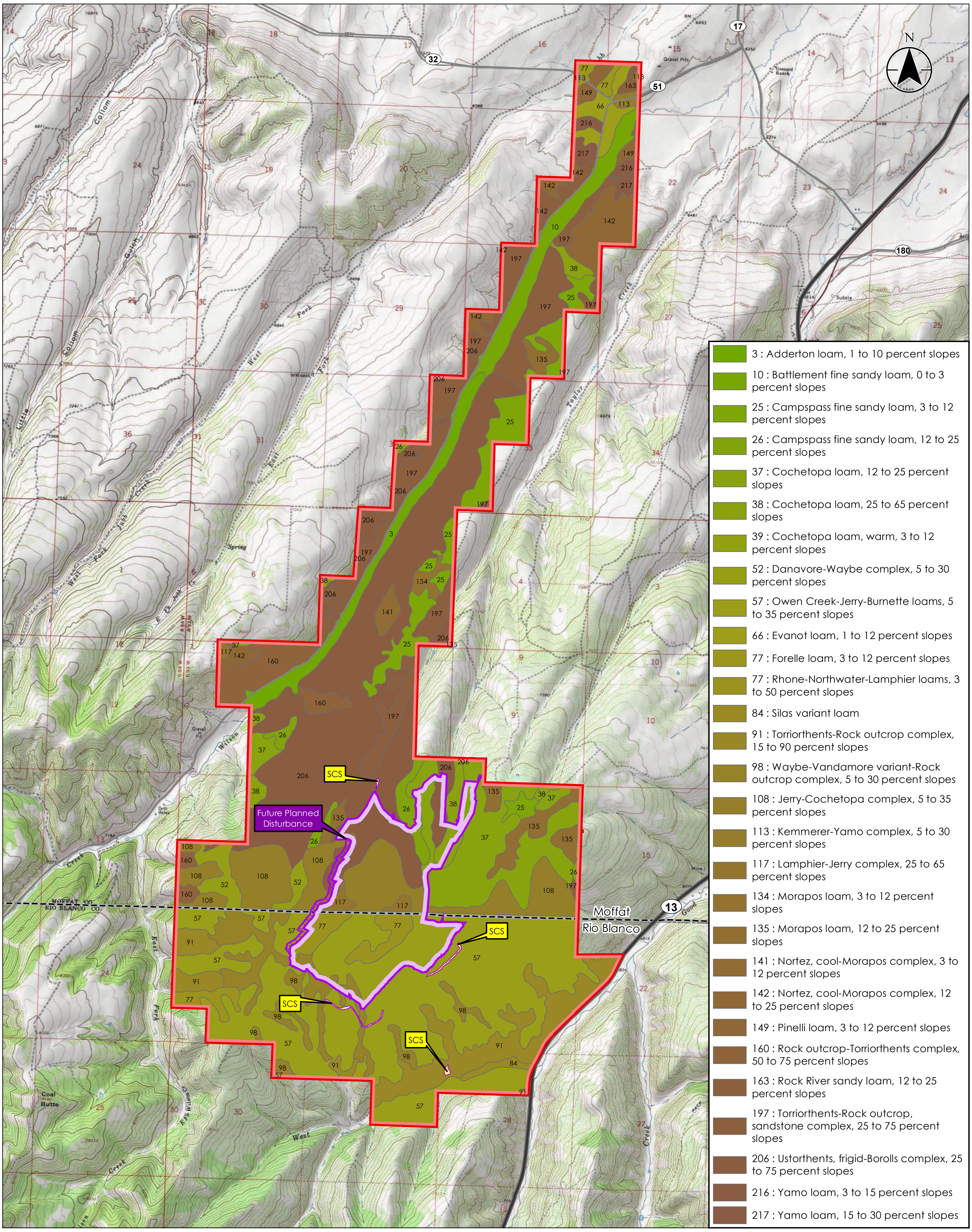
3.21 SOILS

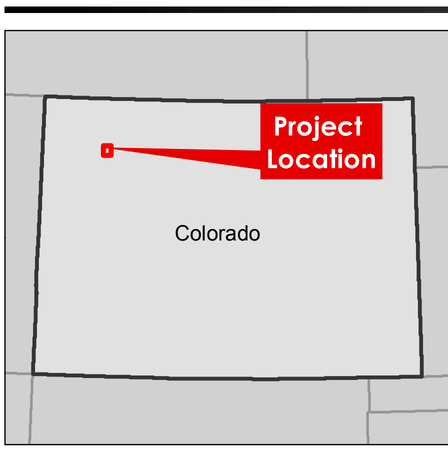
Soils within the Project Area are variable, depending on the combination of parent materials, slope, microclimate, aspect, location and stability of the slopes, age, and their history of use. The dominant soil types were formed primarily from alluvium, colluvium, or in-place residuum of sandy, silty, or clayey bedrock. Alluvial soils are located in drainages derived from the transport of upslope materials by water processes. Colluvial soils are derived from materials transported from upslope positions by gravity. Relatively unweathered bedrock exposures are also observed, where soil development processes do not keep up with the tendency of the rock to erode from water or wind processes.

The soils of the Project Area are typical of soils found in the cold, semi-arid region of northwest Colorado. The soils range from shallow (less than 20 inches to bedrock) and moderately deep (20-40 inches) to deep (greater than 40 inches thick), and are developing in weathered, interbedded sandstone, siltstone, and shale, as well as in local colluvium, slopewash, and stream-laid alluvium. Plant rooting depth corresponds with soil depth. Most soils are moderately well drained to well drained. Soils support mostly native vegetation used for livestock grazing and wildlife habitat.

The soil survey for Moffat County was completed by the USDA Natural Resources Conservation Service (NRCS) and was used to describe the various mapping units below (NRCS 2005). The older NRCS Rio Blanco County soil survey information (NRCS 1982) was used for the southern part of the Project Area; both sets of information were compiled by Colowyo (2007) (**Figure 3-11**). The two surveys used different mapping unit names due to the time of the survey and changes in NRCS classification system. Similar, essentially equivalent soil types were given different mapping unit numbers and names depending upon which survey applied.

Close to 30 soil mapping units were determined to occur within the bulk of the Project Area in Moffat County and close to 10 others were determined to occur within the portion of the Project Area that occurs in Rio Blanco County (**Figure 3-11**). However, based on the inference above, it is likely that there is some overlap in these numbers. The dominant soil types found in the Project Area are briefly described below, by county.





Project Area
Future Planned Disturbance
Actual Disturbance since PR 02
Sediment Control Structure (SCS)
County Road
Highway
County Boundary

0 4,000 8,000 Feet
1:48,000 (At Original document size of 11x17)

Notes
1: Coordinate System: NAD 1983 UTM Zone 13N
2: Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
3-11

Title
Soils

Moffat County Soil Mapping Units (NRCS 2005)

Map Unit 3 - Adderton loam, 1 to 10 percent slopes

The elevation for this mapping unit is 7,000 to 8,500 feet amsl. Annual precipitation is 16 to 20 inches and the frost free period is 50 to 75 days. Primary makeup of this mapping unit is Adderton and similar soils, with some minor components that are moderately well drained or somewhat poorly drained. The unit is found on alluvial fans and in drainage ways, and soils formed in alluvium derived from various sedimentary rock types. This soil type is well drained.

Map Unit 10 - Battlement fine sandy loam, 0 to 3 percent slopes

The elevation for this mapping unit is 6,000 to 6,800 feet amsl. Annual precipitation is 11 to 15 inches and the frost free period is 75 to 90 days. Battlement fine sandy loam is the dominant soil in this unit, but also included are small areas of Cowestgien soils and Battlement saline soils. The parent material is alluvium. This soil type is well drained and moderately well drained. It is found on floodplains and stream terraces.

Map Unit 25 - Campspass fine sandy loam, 3 to 12 percent slopes

The elevation for this mapping unit is 6,800 to 7,600 feet amsl. Annual precipitation is 16 to 18 inches and the frost free period is 65 to 85 days. Campspass and similar soils make up 90 percent in the mapping unit with minor components making up the remaining 10 percent. The parent material is residuum, derived from sandstone and shale. This soil type is well drained. The minor soils are rock outcrops and Morapos and similar soils.

Map Unit 26 - Campspass fine sandy loam, 12 to 25 percent slopes

The elevation for this mapping unit is 6,800 to 7,600 feet amsl. Annual precipitation is 16 to 18 inches and the average frost-free period is 65 to 85 days. Campspass fine sandy loam is the dominant soil in this unit, but small areas of Nortez soils and rock outcrop are also included. The parent material is residuum derived from sandstone and shale. This soil type is very deep and well drained. It is found on mountainsides.

Map Unit 37 - Cochetopa loam, 12 to 25 percent slopes

The elevation for this mapping unit is 7,200 to 8,300 feet amsl. Annual precipitation is 18 to 20 inches and the frost-free period is 50 to 75 days. Eighty-five percent of the mapping unit is Cochetopa soil with 15 percent minor component. The fine, montmorillonitic Argic Pachic Cryoborolls has residuum derived from sandstone and shale parent material and is a deep, well-drained soil. The minor soils are Jerry and similar soils, and Routt and similar soils.

Map Unit 38 - Cochetopa loam, 25 to 65 percent slopes

The elevation for this mapping unit is 7,200 to 8,500 feet amsl. Annual precipitation is 18 to 20 inches and the average frost-free period is 50 to 75 days. Cochetopa loam is the dominant soil type in this unit, but also included are a few small areas of rock outcrop, soils that are shallow over sandstone, and Jerry soils. The parent material is residuum derived from sandstone and shale. This soil is very deep, and well drained. It is found on mountainsides.

Map Unit 39 - Cochetopa loam, 3 to 12 percent slopes

The elevation for this mapping unit is 7,200 to 8,300 feet amsl. Annual precipitation is 18 to 20 inches and the average frost-free period is 50 to 75 days. Cochetopa loam is the dominant soil type in this unit, but also included are a few small areas of Jerry soils and Routt soils. The parent material is residuum derived from sandstone and shale. This soil is very deep, and well drained. It is found on hilltops and plateaus.

Map Unit 52 - Danavore-Waybe complex, 5 to 30 percent slopes

The elevation for this mapping unit is 7,200 to 8,600 feet amsl. Annual precipitation is 18 to 20 inches and the average frost-free period is 50 to 75 days. This unit is 45 percent Danavore soil and 30 percent Waybe soil. Included in this unit are small areas of rock outcrop, and soils similar to the Danavore soil but have dark colored surface layers. Danavore soils formed in residuum derived from interbedded sandstone and shale, and Waybe formed in residuum derived from shale. Both the Danavore and Waybe soils are well drained. This unit is found on narrow ridge crests and mountain sides.

Map Unit 66 - Evanot loam, 1 to 12 percent slopes

The elevation for this mapping unit is 6,200 to 7,200 feet amsl. The average annual precipitation is 13 to 15 inches and the average frost-free period is 75 to 95 days. The dominant soil type is Evanot loam, but included in this unit are small areas of Forelle soils. This mapping unit formed in loess, is a very deep, well-drained soil, and is found on benches and hillslopes.

Map Unit 77 - Forelle loam, 3 to 12 percent slopes

The elevation for this mapping unit is 6,200 to 7,200 feet amsl. The average annual precipitation is 11 to 13 inches and the average frost-free period is 75 to 95 days. This unit is 85 percent Forelle and similar soil. It is formed in loess and in alluvium derived from shale and sandstone. The Forelle soil is well drained. This unit is found on benches.

Map Unit 108 - Jerry-Cochetopa Loams, 5 to 35 percent slopes

The elevation for this mapping unit is 7,200 to 8,600 feet amsl. Annual precipitation is 18 to 20 inches and the frost free period is 50 to 75 days. This unit is 50 percent Jerry soil and 35 percent Cochetopa soil, with minor components of several other soils. The parent material of both major soils is residuum, derived from shale. Both are well drained. The minor soils include Waybe soils, Danavore soils, Lamphier soils, and Skyway soils, as well a soil similar to the Jerry soil but which is moderately deep to shale bedrock.

Map Unit 113 - Kemmerer-Yamo complex, 5 to 30 percent slopes

The elevation for this mapping unit is 6,100 to 7,200 feet amsl. The average annual precipitation is 11 to 13 inches and the average frost-free period is 75 to 95 days. This unit is 60 percent Kemmerer soil and 20 percent Yamo soil. Included in this unit are small areas of Moyerson, Pinelli and Forelle soils. The Kemmerer soil is moderately deep and well drained. It formed in residuum derived from shale. The Yamo series is very deep and well drained. It is formed in alluvium derived from sandstone and in loess. This mapping unit is found on hillsides.

Map Unit 117 - Lamphier-Jerry complex, 25 to 65 percent slopes

The elevation for this mapping unit is 7,200 to 8,600 feet amsl. The average annual precipitation is 18 to 20 inches and the average frost-free period is 50 to 75 days. This unit is 45 percent Lamphier soil and 30 percent Jerry soil. Included in this unit are small areas of rock outcrop, and Danavore soils, Skyway soils, and soils that are moderately deep and contain more than 35 percent rock fragments. The Lamphier soil is very deep and well drained. It formed in mixed colluvium and residuum derived from sandstone. The Jerry soil is very deep and well drained. It formed in colluvium and residuum derived from shale. This map unit is on mountain sides.

Map Unit 134 - Morapos loam, 3 to 12 percent slopes

The elevation for this mapping unit is 6,400 to 7,600 feet amsl. The average annual precipitation is 16 to 18 inches and the average frost-free period is 65 to 85 days. The dominant soil in the unit is Morapos, which is a very deep, well-drained soil. It formed in residuum derived from shale and in loess. Included in this unit are small areas of Nortez soils and Campspass soils. This mapping unit is found on plateaus.

Map Unit 135 - Morapos loam, 12 to 25 percent slopes

The elevation for this mapping unit is 6,400 to 7,600 feet amsl. The average annual precipitation is 16 to 18 inches and the average frost-free period is 65 to 85 days. This unit is 85 percent Morapos and similar soils. It is formed in residuum derived from shale. The Morapos soil is well drained. It is found on mountain slopes.

Map Unit 141 - Nortez, Cool-Morapos loams, 3 to 12 percent slopes

The elevation for this mapping unit is 6,400 to 7,600 feet amsl. The average annual precipitation is 16 to 18 inches and the average frost-free period is 65 to 85 days. This unit is 50 percent Nortez soil and 40 percent Morapos soil. Included in this unit are small areas of rock outcrop, Maudlin soils, Duffymont soils, and Iles soils. The Nortez soils are moderately deep and well drained. It formed in residuum derived from interbedded sandstone and shale. The Morapos soil is very deep and well drained. It formed in residuum derived from shale. This map unit is located on plateaus.

Map Unit 142 - Nortez, Cool-Morapos complex, 12 to 25 percent slopes

The elevation for this mapping unit is 6,400 to 7,600 feet amsl. Annual precipitation is 16 to 18 inches and the frost free period is 65 to 85 days. Nortez and similar soils account for 50 percent of this soil type while Morapos and similar soils account for 40 percent, and minor components accounting for 10 percent. Nortez soils are derived from interbedded sandstone and shale while Morapos soils are derived from shale. This soil type is well drained. The minor components of this unit include rock outcrop, Mauslin and similar soils, Duffymont and similar soils, and Cochetopa and similar soils.

Map Unit 149 - Pinelli loam, 3 to 12 percent slopes

The elevation for this mapping unit is 6,200 to 7,000 feet. The average annual precipitation is 12 to 14 inches and the average frost-free period is 75 to 95 days. The dominant soil is Pinelli loam, and there are a few small areas of Evanot and Forelle soils. The Pinelli series consists of very deep, well-drained soils that are found on the benches and alluvial fans. Pinelli soils are formed in alluvium derived from shale and in loess.

Map Unit 160 - Rock outcrop-Torriorthents complex, 50 to 75 percent slopes

The elevation for this mapping unit is 5,900 to 8,000 feet amsl. Annual precipitation is 9 to 16 inches and the frost-free period is 75 to 105 days. Seventy percent of the map unit is rock outcrop, 25 percent are Torriorthents and similar soils, and 5 percent minor components. Rock outcrop is not described as a soil, thus depth and drainage classes are not applicable. Torriorthent soils are shallow and well-drained.

Map Unit 163 - Rock River sandy loam, 12 to 25 percent slopes

The elevation for this mapping unit is 6,200 to 7,300 feet amsl. The average annual precipitation is 11 to 13 inches and the average frost-free period is 75 to 95 days. The dominant soil in this mapping unit is Rock River sandy loam. Included in this unit are small areas of Forelle soils and Beriake soils. The Rock River sandy loam is well drained soil that formed in residuum derived from sandstone. This mapping unit is found on hill sides.

Map Unit 197 - Torriorthents-Rock outcrop, Sandstone complex, 25 to 75 percent slopes

The elevation for this mapping unit is 6,000 to 8,000 feet amsl. Annual precipitation is 9 to17 inches and the frost-free period is 75 to 105 days. Fifty-five percent of the map unit is Torriorthents and similar soils, 35 percent are rock outcrop, and 10 percent minor components. Torriorthent soils are shallow and well-drained. The minor soil is Deep Loamy Soils and similar soils.

Map Unit 206 - Ustorthents, Frigid-Borolls complex, 25 to 75 percent slopes

The elevation for this mapping unit is 7,000 to 8,500 feet amsl. Annual precipitation is 16 to 20 inches and the freeze free period is 50 to 85 days. Ustorthents and similar soils account for 55 percent of this unit while Borolls and similar soils account for 35 percent with the remaining 10 percent minor components. Both Ustorthents and Borolls soils are derived from sedimentary rocks and are well-drained. Minor components include Abor and similar soils, and Rencot and similar soils.

Map Unit 216 - Yamo loam, 3 to 15 percent slopes

The elevation for this mapping unit is 6,200 to 7,000 feet amsl. The average annual precipitation is 11 to 13 inches and the average frost-free period is 75 to 95 days. Yamo soils are the dominant soil type in this mapping unit. Yamo soils are formed in alluvium derived from sandstone and in loess. They are well drained soils. Included in this unit are a few small areas of Forelle soils. This mapping unit is found on the toeslopes of hills and benches.

Map Unit 217 - Yamo loam, 15 to 30 percent slopes

The elevation for this mapping unit is 6,200 to 7,000 feet amsl. The average annual precipitation is 11 to 13 inches and the average frost-free period is 75 to 95 days. Included in this unit are small areas of soil similar to the Yamo loam that has sandstone bedrock at a depth of 20 to 40 inches. Also included are small areas of rock outcrop. The Yamo loam is a very deep, well-drained soil found on hill sides. It formed in loess and residuum derived from sandstone.

Rio Blanco County Soil Mapping Units (NRCS 1982)

Map Unit 57 - Owen Creek-Jerry-Burnette Loams, 5 to 35 percent slopes

The elevation for this mapping unit is 7,200 to 8,600 feet amsl. Annual precipitation is 18 to 22 inches and the freeze free period is 45 to 75 days. Owen Creek and similar soils account for 40 percent of this unit, Jerry and similar soils account for 30 percent, and Burnette and similar soils account for 20 percent. The remaining 10 percent are minor components. Parent material of the three dominant soils is residuum weathered from sandstone and shale. They are well drained and moderately deep (Owen Creek) to deep (Jerry and Burnette). This unit appears to correlate with Moffat County Map Unit 108.

Map Unit 77 - Rhone-Northwater-Lamphier loams, 3 to 50 percent slopes

Note that both the Moffat and Rio Blanco surveys have a mapping unit 77 in the Project Area; they are different units. The elevation for this mapping unit is 7,400 to 8,600 feet amsl. The average annual precipitation is 18 to 22 inches and the average frost-free period is 45 to 75 days. This unit is 40 percent Rhone loam that has slopes of 3 to 50 percent, 30 percent Northwater loam that has slopes of 3 to 50 percent, and 20 percent Lamphier loam that has slopes of 8 to 35 percent. Included in this unit are small areas of Burnette, Cochetopa, Jerry, and Silas loams. The Rhone and Northwater soils are deep and well drained. They formed in residuum derived dominantly from sandstone. The Lamphier soil is very deep and well drained. It formed in mixed colluvium and residuum derived from sandstone. This map unit is on mountain sides and valley sides.

Map Unit 84 - Silas Variant loam, 1 to 3 percent slopes

Elevation for this unit is 7,000 to 7,500 feet amsl. The average annual precipitation is 16 to 20 inches and the average frost-free period is 80 to 105 days. The Silas variant loam is the dominant soil, but included in this unit are small areas of Hagga and Shawa loams. The Silas variant loam is a deep, well-drained soil on alluvial valley floors, on fans, and in swales on terraces. It formed in mixed alluvium.

Map Unit 91 - Torriorthents-Rock outcrop, 15 to 90 percent slopes

The elevation for this mapping unit is 5,100 to 7,500 feet amsl. Annual precipitation is 8 to18 inches and the frost-free period is 70 to 130 days. Fifty percent of the map unit is Torriorthents and similar soils, 30 percent are rock outcrop, and 15 percent minor components. Torriorthent soils are shallow and well-drained. Rock outcrop is not described as a soil, thus depth and drainage classes are not applicable. This unit appears to correlate with Moffat County Map Unit 197.

Map Unit 98 - Waybe-Vandamore variant-Rock outcrop complex, 5 to 30 percent slopes

The elevation for this mapping unit is 7,400 to 8,600 feet amsl. Annual precipitation is 16 to 20 inches and the freeze free period is 45 to 75 days. Waybe and similar soils account for 45 percent of this unit, Vandamore variant and similar soils account for 25 percent, and rock outcrop accounts for 20 percent. The remaining 10 percent are minor components. Parent material of the two dominant soils is interbedded clayey residuum weathered from sandstone and shale. They are well drained and shallow (Waybe) to moderately deep (Vandamore variant). Rock outcrop is not described as a soil, thus parent material, depth, and drainage classes are not applicable.

3.22 PRIME FARMLANDS

CDRMS has determined that no prime farmlands exist within the Project Area (CDRMS 2007). This determination was based on: 1) a December 18, 1980 letter from the NRCS which documented that no prime farmland mapping units are located within the pre-PR02 permit area; 2) Colowyo consultation with NRCS in 2002 in which NRCS indicated that no areas of prime farmland are present in the PR02 area; and 3) Colowyo's assessments of soil survey information (Colowyo 2007). Therefore prime farmlands will not be discussed further. Prime farmland information can be found in the mine permitting information (Colowyo 2007) in Section 2.04.12.

3.23 ALLUVIAL VALLEY FLOORS

Pursuant to the SMCRA and in accordance with federal regulations at 30 CFR 785.19 a. (2) i., an alluvial valley floor (AVF) is defined as a valley: 1) that is located in the arid or semi-arid regions of the U.S. (west of the 100th meridian west longitude); 2) that contains deposits laid down by one or more streams; 3) where at least one stream currently exists; and 4) where there is sufficient water available to support agriculture. Pursuant to the SMCRA and the CDRMS, "alluvial valley floors" means "the unconsolidated stream-laid deposits holding streams with water availability sufficient for subirrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits formed by unconcentrated runoff or slope wash, together with talus, other mass movement accumulations and windblown deposits." The SMCRA further defines "unconsolidated stream-laid deposits holding streams" as meaning "all flood plains and terraces located in the lower reaches of valleys which contain perennial or other streams with channels that are greater than three feet in bankfull width and greater than 0.5 feet in bankfull depth". Because AVFs are critical for agriculture in arid and semi-arid regions, the SMCRA requires the regulatory authority (CDRMS in Colorado) to determine if AVFs exist within or adjacent to a proposed surface coal mining area. If CDRMS determines one or more alluvial valley floors do exist, the SMCRA requires that CDRMS then determine whether the proposed mining operations may affect the alluvial valley floor, or the waters that supply it. If the AVFs or associated water sources may be affected, CDRMS may then either prohibit mining or require the mining permit applicant to comply with specific performance criteria to eliminate or mitigate the potential effects on the AVFs or their water sources.

As a part of CDRMS' Proposed Decision and Findings of Compliance for the Colowyo Coal Mine C-1981-019 Permit Revision No. 2 dated May 4, 2007, CDRMS determined that AVFs exist within or adjacent to the Project Area, associated with Wilson Creek and Good Spring Creek (CDRMS 2007). It also determined that neither Taylor Creek nor West Fork Good Spring Creek met the criteria to be called an AVF. The AVF characteristics of Wilson and Good Spring creeks are described below. These areas are outside the areas to be mined.

Wilson Creek was found to contain sufficient Quaternary aged, unconsolidated, stream-laid materials, as well as sufficient water to support sub-irrigation. Further, portions of Wilson Creek within and downstream of the Project Area have likely been historically irrigated using flood irrigation practices. As of 2007, grass was being flood irrigated along a stream reach upstream of the Project Area. CDRMS (2007) thus determined that AVFs are present from the confluence of East and West Forks of Wilson Creek downstream to "the approximate center of Section 7, T3N, R93W", as well as from the southeast quarter of Section 21, T4N, R93W downstream to the mouth of Wilson Creek. The reach in between these two segments of Wilson Creek is largely affected by an erosion and mass wasting event and was thus excluded from the determination.

Good Spring Creek was also found to contain sufficient Quaternary aged, unconsolidated, stream-laid materials, as well as sufficient water for sub-irrigation. Portions of Good Spring Creek valley, as of 2007, were also flood irrigated for pasture grass for hay and livestock forage production. CDRMS (2007) thus determined that an AVF is present from the confluence with West Fork Good Spring Creek downstream to its mouth.

The identified AVFs associated with Wilson and Good Spring creeks are mostly outside of (but close to) the Project Area (**Figures 3-5a** and **3-5b**), though short reaches are within its boundaries. However, they do not occur within areas to be mined.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES (DIRECT AND INDIRECT IMPACTS)

4.1 INTRODUCTION

This chapter discusses the potential physical, biological, cultural, and socioeconomic direct and indirect effects[1,2] of Alternative A (Proposed Action, PR02 as Approved in 2007), Alternative B (PR02 as Revised), and the No Action Alternative as described in **Chapter 2**. Direct impacts are defined as those impacts which are caused by the action and occur at the same time and place. Indirect impacts are those that are caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable. Impacts may also be short term (also referred to as temporary) or long term. Short-term impacts generally occur for a short period during a specific point in the mining process. Long-term impacts would generally last the life of the Project and beyond. Finally, impacts are described by their level of significance (i.e., major, moderate, minor, negligible, or no impact). An impact is considered to be major if it would result in a substantial change to the environment. An impact is considered moderate or minor if it would not result in a substantial environmental change but could still have some effect. The determination of whether an impact is moderate or minor varies for each resource and the context of the specific proposed action. In contrast to no impact, a negligible impact is one that would occur but at the lowest limits of detection of an effect. The analysis applies quantitative thresholds when available, to determine the level of significance. Other issues have been analyzed qualitatively where necessary.

NEPA requires federal agencies to take a hard look at and disclose to the public the potential effects on the human environment of proposed future projects or activities that require a federal approval. As such, in the case of a typical project proposed for the future, OSMRE would determine and analyze the nature and scope of future impacts that would potentially occur if the project or action were to either be approved, or not approved by OSMRE. In a typical case, the EA would inform the federal agency of the nature and scope of potential environmental impacts of the proposed project before a decision on the project is made. However, in the case of this EA, as required by the May 8, 2015 court order (*WildEarth Guardians v. U.S. Office of Surface Mining et al.*, Case 1:13-cv-00518-RBJ [D. Colo. 2015]), OSMRE must re-evaluate the mining plan modification for PR02 that was approved by the ASLM in 2007 and has been implemented through mining coal from the South Taylor Pit over the past seven years. In this context, each resource section in Chapter 4 below is organized in the following manner:

- Alternative A – For this alternative, the analysis goes back in time and evaluates the Project as if no mining or related surface disturbance for PR02 has yet occurred. This is a very unusual approach to be utilized in a NEPA document but is necessary to

[1] Environmental Justice and Prime Farmlands are not discussed in Chapter 4 because these resources do not occur in the Project Area.
[2] Cumulative impacts are discussed in Chapter 5.

effectively address the court order. This alternative includes a description and discussion of the potential impacts of PR02 as it was approved in 2007 from the perspective of analyzing the "future" (2007 and later) effects of the Project. The effects are analyzed as if mining would occur in accordance with PR02 as approved in 2007 (**Chapter 2**, Colowyo 2007) without any subsequent revisions. In other words, if mining proceeded exactly how it was authorized under PR02 as approved in 2007, Alternative A would have included *1,181*[3] acres of planned new surface disturbance. In addition, under PR02 as approved in 2007, mining was planned to end and the South Taylor final pit closure was planned to commence in 2017. The final active reclamation (i.e., regrading, not vegetation growth) would occur over three years until approximately 2020. The analysis of the potential impacts for Alternative A was performed for this EA with the information that would have been available to OSMRE back in 2007.

- Alternative B – Impacts described and discussed under Alternative B include both impacts that have already occurred, as well future potential impacts, which is not typical for NEPA documents. The impact discussion for this alternative first includes a description of the impacts that have already occurred since mining began in 2008 under the approved PR02 with subsequent revisions, up through the present (previous impacts). Approximately 789 acres of new surface disturbance has already occurred since 2007, which comprises nearly the entire new surface disturbance associated with Alternative B. In addition, approximately 66 acres of reclamation has already occurred under Alternative B[4]. The discussion of previous impacts is followed by a description and discussion of the impacts that could be expected to occur between the remainder of 2015 and the end of projected mining under the revised PR02 in about 2019 (potential impacts). Only approximately 20 acres of additional new surface disturbance (for a total of 809 acres) is planned under Alternative B. This new 20-acre disturbance would occur during reclamation activities and after mining is complete. The final active reclamation would occur until approximately 2022.

- No Action Alternative – The "previous impacts" are described under Alternative B but apply to the time period from 2008 to 2015. These descriptions are not repeated under the No Action Alternative. Instead, the impact description and discussion focuses on future potential impacts resulting from implementation of No Action. Under this alternative, the ASLM would not re-approve the mining plan modification for PR02 as a result of this re-evaluation. This would mean that the mining operations at the South Taylor pit would cease in approximately September 2015, and South Taylor final pit closure activities would commence. Reclamation of all remaining disturbed areas would also commence with closure activities; similar to the action alternatives, active reclamation would occur over the next three years. Colowyo would be responsible under their lease terms *and their SMCRA permit* to complete all reclamation requirements for PR02.

[3] *Rounded from 1,180.7 (**Chapter 2**)*

[4] *To date*, this reclamation has included backfilling, grading, and topsoiling of 66 acres, and seeding of 54 acres.

4.1.1 Summary Comparison of Direct and Indirect Environmental Impacts

Table 4.1-1 summarizes and compares the potential environmental direct and indirect impacts associated with the alternatives (cumulative impacts are discussed in **Chapter 5**).

Table 4.1-1 Comparison of Direct and Indirect Impacts

Resource	Alternative A	Alternative B[1]	No Action Alternative
Topography	After reclamation, impacts to topography would be negligible.	Same as Alternative A.	Same as Alternative A.
Air and Climate Resources			
Direct mining criteria emissions	Negligible impact on Colorado (0.002 to 0.79%) and U.S. (0.00002 to 0.01%) emissions. Moderate to high impact on regional emissions (0.02 to 19.6%), but region would remain in attainment.	*Negligible impact on Colorado (0.001 to 0.46%) and U.S. (0.00001 to 0.01%) emissions. Moderate to high impact on regional emissions (0.01 to 9.8%), but region would remain in attainment.*	Impacts would be negligible and less than those under either Alternatives A or B.
Direct GHG[2] emissions	Negligible impact on Colorado (0.25%) and U.S. (0.014%) total annual GHG emissions.	*Negligible impact on Colorado (0.06%) and U.S. (0.003%) total annual GHG emissions.*	Impacts would be negligible and less than those under either Alternatives A or B.
Indirect coal combustion criteria emissions	Negligible indirect impact on U.S. (0.00029 to 0.1428%) National Emissions Inventory. Moderate indirect impact on total Colorado (0.02 to 8.63%) and moderate to high regional (0.1 to 118.3%) emissions, but region would remain in attainment.	*Negligible indirect impact on U.S. (0.00019 to 0.095%) National Emissions Inventory. Moderate indirect impact on total Colorado (0.01 to 5.75%) and moderate to high regional (0.05 to 78.8%) emissions, but region would remain in attainment.*	Impacts would be similar to Alternatives A or B, because the generating stations would likely continue to burn coal at the same rate but using coal from elsewhere.
Indirect combustion GHG emissions	Negligible indirect impact on U.S. (0.*231*%) and global (0.*048*%) annual GHG emissions.	*Negligible indirect impact on U.S. (0.071%) and global (0.015%) annual GHG emissions.*	Impacts would be similar to Alternatives A or B, but the generating stations would likely continue to burn coal at the same rate but using coal from elsewhere. *Emissions changes would be dependent on the alternative coal combusted.*
Indirect coal combustion mercury deposition impacts	Minor percentage (8.3%) of the total mercury generated in Colorado.	Negligible to minor percentage (3.4%) of the total mercury generated in Colorado.	Impacts would be negligible similar to Alternatives A or B, but the generating stations would likely continue to burn coal at the same rate but using coal from elsewhere.

Resource	Alternative A	Alternative B[1]	No Action Alternative
Ozone	Ozone NAAQS would not be exceeded.	Same as Alternative A.	Impacts would be negligible and less than those under either Alternatives A or B.
Geology	Negligible to minor, long-term impact on the geological column.	Negligible impacts.	Same as Alternative B.
Water Resources			
Hydrologic balance	No change.	Same as Alternative A.	Same as Alternative A.
Water withdrawal and transport	Negligible direct impact to Yampa River water quantity. No impact related to transport. Negligible indirect impact to Yampa River water quantity from Craig Generating Station. No impact related to transport	Same as Alternative A	Same as Alternative A, but *impacts* would immediately cease.
Surface water quality	Negligible to minor increase in TDS[3].	Same as Alternative A.	Same as Alternative A.
Groundwater impacts	Negligible impacts to groundwater.	Same as Alternative A.	Same as Alternative A.
Indirect iron, mercury, and selenium impacts from coal combustion	Negligible iron loadings. Incremental but unquantifiable addition to baseline mercury concentrations. Incremental but unquantifiable addition to baseline selenium concentrations.	Same as Alternative A.	Same as Alternative A.
Indirect coal combustion impacts to groundwater	Negligible indirect impact to groundwater related to CCRs[4].	Less than Alternative A but still negligible.	Less than Alternatives A or B but still negligible.
Vegetation	Short-term to major impacts until reclamation replaced vegetation to approved reclamation plan (or improved) conditions. Reclamation would replace *1,181* acres of previously disturbed vegetation; areas that are already reclaimed would continue to proceed through natural succession or management under future land uses.	Negligible impacts until reclamation replaced vegetation to approved reclamation plan (or improved) conditions. Reclamation would replace 809 acres of previously disturbed vegetation; areas that are already reclaimed would continue to proceed through natural succession or management under future land uses.	No additional extraction related disturbance to vegetation would occur. Reclamation would happen sooner and would replace vegetation to approved reclamation plan (or improved) conditions on 789 acres of previously disturbed vegetation; areas that are already reclaimed would continue to proceed through natural succession or management under future land uses.

Resource	Alternative A	Alternative B[1]	No Action Alternative
Wetlands	Negligible impacts to wetlands after mitigation.	No impact to wetlands.	No impact to wetlands.
Fish and Wildlife			
Big game	Short-term minor to moderate impact on game range until reclamation replaced habitat to approved reclamation plan (or improved) conditions.	Negligible impacts until reclamation replaced habitat to approved reclamation plan (or improved) conditions.	No impacts. Reclamation would replace habitat to approved reclamation plan (or improved) conditions.
Migratory birds, raptors, reptiles, and amphibians	Negligible to minor impacts.	Negligible impacts.	Negligible impacts.
Fisheries	No direct impacts to fisheries. See Special Status Species below for indirect effects to Colorado River fish.	Same as Alternative A.	Same as Alternative A.
Special Status Species	*Impacts to state-listed and sensitive species would be short term and negligible to moderate until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat.* *Impacts to the Colorado River fish from mercury and selenium impacts would be moderate. Impacts to the yellow-billed cuckoo would be minor. Research and funding proposed as mitigation would offset adverse impacts.*	*Impacts to state-listed and sensitive species would be the similar to Alternative A, but the additional disturbance under Alternative B is unlikely to change any impacts from their current levels due to the limited amount of additional acres involved.* *Impacts to the Colorado River fish and yellow-billed cuckoo would be similar to Alternative A. However, as less Colowyo coal would be combusted, the adverse impacts would be reduced accordingly.*	Same as Alternative A.
Cultural and Historic Resources	No impacts.	Same as Alternative A.	Same as Alternative A.
Indian Concerns	No impacts.	Same as Alternative A.	Same as Alternative A.
Socioeconomics	Moderate to major, short-term (two years) beneficial impacts related to annual payroll, insurance, retirement, local expenditures, taxes, and royalty payments.	Same as Alternative A, but a greater (~$70 million) contribution to the local economy than Alternative A due to two years longer mine life.	Immediate economic loss to the local community would be at least $70 million when compared to Alternative A and approximately $140 million when compared to Alternative B.
Visual Resources	Minor short-term and long-term impacts that would still meet Class IV objectives.	Same as Alternative A.	Same as Alternative A.

Resource	Alternative A	Alternative B[1]	No Action Alternative
Recreation	Negligible to minor, short-term impacts to recreation until reclamation.	Same as Alternative A.	Same as Alternative A.
Paleontology	*The significance of the potential damage and removal of fossils during removal of the geological column, as well as the beneficial impact of increasing the potential for discovery of scientifically significant fossils, would depend upon the significance of the fossil.*	*Same as Alternative A, but due to the lesser removal of the geological column the potential impacts would be less.*	No impacts.
Access and Transportation	Minor, short-term increase in traffic due to increased production rate.	No impacts.	No impacts.
Solid or Hazardous Waste	No impacts.	No impacts.	No impacts.
Noise	Minor, short-term increase in noise due to increased production rate. It is unlikely the increased noise would reach residences located near the Project Area boundary.	No change in noise, but the current noise levels would extend two years longer than under Alternative A.	Noise levels would decrease substantially.
Livestock Grazing	Negligible to moderate, short-term impact on the availability for grazing.	The impacts on livestock and grazing would be the same as those under Alternative A, but grazing would be reinstated 2 years later than under Alternative A.	Grazing would be reinstated four or two years earlier than under Alternatives A or B, respectively.
Soils	Negligible impacts related to erosion and fertility loss.	Same as Alternative A.	Same as Alternative A.
Alluvial Valley Floors	No impacts.	No impacts.	No impacts.

[1] Only the potential impacts are discussed in this table, not the previous impacts that have occurred since 2007.
[2] greenhouse gas,
[3] total dissolved solids,
[4] coal combustion residues
[5] greater sage-grouse

4.2 TOPOGRAPHY

4.2.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Impacts to topography would occur to *1,181* acres *of previously undisturbed land* within the Project Area. Under Alternative A, the East Taylor permanent valley fill would be constructed to an elevation of 8,050 feet amsl. The West Taylor permanent valley fill would be constructed to an elevation of 8,400 feet amsl. The East Taylor temporary spoil pile would be constructed east of the East Taylor permanent valley fill, to an elevation of 8,300 feet amsl. The West Taylor temporary spoil pile would be constructed on top of the East Taylor permanent valley fill to an elevation of 8,300 feet amsl. As part of reclamation, the pit would be backfilled using the overburden stored in the temporary spoil piles. All areas previously disturbed would be backfilled and graded to their approved post-mining topographies, surfaces would be recontoured to their approved conditions, and surface drainage patterns would be established per the approved reclamation plan. The final surface configuration (Post-mining Topography Map [Map19B], **Appendix B**) also would provide topographic relief for wildlife habitat. The regrading plan would re-establish escape cover, south facing slopes for wintering big game populations, and small drainages suitable as future location of stock ponds necessary to achieve the post-mining land use. After reclamation has been completed, the impacts to topography would be negligible.

4.2.2 Alternative B – PR02 as Revised

4.2.2.1 Previous Impacts

Impacts to the local topography have already occurred on 789 acres within the Project Area since 2007. The new disturbance consists of the South Taylor open pit, the West Taylor valley fill, a portion of the East Taylor valley fill, the East Taylor and West Taylor temporary spoil piles, and topsoil stockpiles. The East Taylor permanent valley fill is constructed to an elevation of 7,990 feet amsl. The West Taylor permanent valley fill is constructed to an elevation of 7,950 feet amsl. The West Taylor temporary spoil pile is complete and constructed to 8,200 feet amsl in elevation. The South Taylor open pit has lowered the overall elevation in this location. Conversely, the valley fill facilities, temporary spoil piles, and topsoil stockpiles have increased the elevation in these locations. Approximately 66 acres have been reclaimed to date, which has established the approved post-mining topography on this portion.

4.2.2.2 Potential Impacts

Under Alternative B, there would be approximately 20 acres of additional disturbance in addition to the previous impacts. This disturbance would occur on the west side of the South Taylor pit and the West Taylor valley fill. The East Taylor *temporary spoil pile* would become slightly taller during mining as a result of *the addition of up to 1,030,000 cubic yards of material*. In general, the impacts to topography would be similar to those under Alternative A. After reclamation has been completed, the impacts to topography would be negligible.

4.2.3 No Action Alternative

Under the No Action Alternative, mining would cease and closure and reclamation would be initiated. The temporary spoil piles would not increase in elevation but would stay at their current elevations until reclaimed. The impacts to topography under closure and reclamation would be similar to those under Alternatives A and B but would occur earlier. After reclamation has been completed, the impacts to topography would be negligible.

4.2.4 Mitigation Measures

No mitigation measures would be necessary for topography.

4.3 AIR AND CLIMATE RESOURCES

4.3.1 Alternative A - Proposed Action, PR02 as Approved in 2007

4.3.1.1 Direct Mining Criteria *Pollutant* Impacts

All emission sources are divided into three primary categories: fugitive emissions, process emissions, and tailpipe emissions. Fugitive emissions include excavation, haulage, and reclamation activities. Process emissions are associated with loading and unloading of coal to hoppers or haul trucks, primary and secondary crushing, conveying to storage areas, railcar loading, and rock crushing and screening. Tailpipe emissions are associated with mine vehicles.

<u>In-Pit Fugitive Emissions Sources</u>

Within the South Taylor pit there are numerous mining activities that contribute to fugitive particulate emissions, including shovels, a dragline, front end loaders (FELS) for overburden and coal, and drilling. *Fugitive emissions, including particulate and NO_X, also occur from the use of explosives for blasting to break apart overburden for removal.* Mobile sources consist of dozers (both overburden and coal), graders, water trucks, and haul trucks. Maximum emission estimates assumed that no reclamation was occurring at the South Taylor pit; thus increasing the mining rate to its capacity.

The pit areas have a blasting component associated with them. *Blasting at the mine currently is limited to 152,000 pounds or 76 tons of explosive material, per day. The mine has submitted a revision to their air quality permit to increase their current blasting limit to 700,000 pounds per day, but that is still under review.*

<u>Other Fugitive Sources</u>

The mine has several coal piles throughout their property all of which can contribute to fugitive emissions due to windblown dust. Also, dozers are *utilized on all* coal piles *at various times. Particulate emissions* are also attributable to travel on both paved and unpaved *haul roads, and traffic in* the boneyard, maintenance parking lot and *maintenance* area.

Process Emission Sources

Colowyo utilizes a primary and secondary coal crushing facility. Each crusher contains multiple sources of particulate emissions. Loading of coal into hoppers, the practice of crushing the coal, conveying into storage bins, and loading into dump trucks are all sources of emissions. Loading coal onto railcars for transport contributes to overall particulate emissions. The mine also has a rock crushing and screening operation.

Tailpipe Emissions Sources

The mine contains a 1.4 mile (2.3 km) paved access road and 3.7 mile (6.0 km) paved haul road. The access road is primarily used by employees coming to and from the mine using typical passenger vehicles *and occasional delivery trucks*. The paved haul road is used by all trucks hauling coal as well as employee vehicles and occasional delivery trucks. To be conservative with this analysis, all vehicles are assumed to travel the entire length of the road each trip, which may lead to an over-estimate of the emissions generated. Maximum emission estimates assume an equivalent of 125 cars, 75 trucks, and 25 delivery vehicles per day for 305 operating days per year. The equivalent number of 50T haul trucks per day is 1,077. The larger 240T truck emissions are calculated based on distance traveled within each appropriate pit, the spoil piles, and haul distances to the R1*and R4* coal *stock*piles.

Water trucks, scrapers, graders, and dozers are assumed to release tailpipe emissions within the pits, the exception being the dozers operated on the G1/G2 and R1*and R4* stockpiles.

Hazardous Air Pollutant Emission Estimates

HAP is defined in 40 CFR part 61 as a pollutant that causes or may cause cancer or serious health effects such as birth defects. There are currently 187 listed HAPs (http://www.epa.gov/ttnatw01/188polls.html).

The action of combustion results in the emission of some HAPs. Similar to other gaseous pollutants associated with the mine, HAPs are a result of tailpipe emissions, blasting, and drilling activities. Diesel equipment engine characteristics, including make and model, were used to establish emissions for graders, scrapers, and dozers. Fuel consumption rates were utilized to determine drilling HAP emissions.

Combustion HAP emission factors for on-road vehicles are based on VOC emissions. Appropriate mass fractions were applied to VOC emission factors for on-road vehicles to obtain each HAP factor, based on EPA's published findings regarding the speciation of toxic VOCs and polycyclic aromatic hydrocarbons (PAH) associated with haul trucks pre and post 2007 (MOVE 2014). Blasting emission factors were based on Amatol (50% ANFO and 50% TNT) from the EPA Open Burn/Open Detonation Dispersion Model database.

4.3.1.2 Alternative A Direct Emission Calculations

Utilizing the assumptions and processes described above, emissions were calculated for criteria pollutants and HAPs (**Table 4.3-1**).

Table 4.3-1 Criteria Pollutant and HAP Emission Estimates (tpy), Alternative A

Source	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2	HAPs
Fugitive	2,286	262	1,736	10,975	0.4	1.0	2.6E-03
Process	8.0	1.1	0	0	0	0	0
Tailpipe	3.6	3.1	149	216	72	0.2	9.1
Total	2,298	266	1,885	11,191	72	1.2	9.1

When comparing gaseous criteria pollutants to state and national totals from the 2011 National Emissions Inventory (NEI)[5], Alternative A would have a negligible impact. On a percentage basis, Alternative A would range from 0.002 percent to 0.79 percent when compared to state totals; SO_2 would be the lowest and CO emissions would be the largest. On a national scale the percentage relative to the NEI would range from 0.00002 percent to 0.*02* percent. SO_2, again, would contribute the least, *and CO* would have the highest percentage. All contributions would be insignificant in comparison. A more regional comparison of gaseous pollutants to four surrounding counties was also conducted. These counties included Garfield, Moffat, Rio Blanco, and Routt. Comparisons would range from 0.2 percent to 19.6 percent.

Particulate emissions would be similar. With fugitive emissions included, Alternative A would contribute *0.26* percent of the statewide $PM_{2.5}$ emissions; with fugitive emissions excluded that percentage would decrease to *0.00004* percent. PM_{10} emissions associated with Alternative A would be *0.70* percent and *0.00004* percent of the statewide total with fugitive emissions included and excluded, respectively. National percentages would be even less at *0.01 percent and 0.004* percent. Direct particulate emissions associated with Alternative A would be insignificant in comparison to Colorado and nationally. The surrounding county comparison showed that Alternative A would be a maximum of 10.3 percent of *the* region's particulate emissions.

The county maximum HAPs comparison of Alternative A would be 10.5 percent of the EPA 2011 NEI. The maximum HAPs emissions contributed by Alternative A would be 0.005 percent of the total HAPs emitted by the State of Colorado per the EPA 2011 NEI. Nationally, 9.05 million tons of HAPs were emitted in 2001 and Alternative A would contribute 0.0001 percent. The amount attributed to Alternative A would be insignificant by comparison.

While there would be a moderate to high contribution of emissions from Alternative A to the region, the surrounding AQCR has consistently maintained its designation of attainment. Monitoring data from 2007 to 2014 support this designation (**Section 4.3.2.4**).

[5] The NEI is a comprehensive estimate of air emissions from all air emission sources in the U.S.

Direct Greenhouse Gas Emission Estimates

Direct GHG emissions sources from onsite mining are in two main categories: the emissions (methane) released by the exposure of the coal seams to the atmosphere and the combustion emissions from mining equipment. The combustion emission component includes gaseous emissions and particulate emissions (black carbon). Each component is described in the following sections.

Methane Emissions from Coal Extraction

Methane (CH_4) is the predominant GHG emitted from direct surface coal extraction and post-extraction handling of coal. Documents developed by the EPA in collaboration with the Russia Coalbed Methane Center were used for determining methane emissions from coal mining and handing. The final methods used are included in the Intergovernmental Panel on Climate Change (IPCC) Guidelines (Irving unknown date). One approach is the Tier 1 approach or Global Average Method. It requires the use of emission factors-based characteristics of coal from regional studies. It should be used when basin specific data is unavailable. Tier 2 is the "Country or Basin Specific Method". Both methods are recommended by the IPCC for surface mining estimates.

A Tier 2 methodology was used to determine methane emissions estimates from extraction for both Alternative A and Alternative B. In addition to methane estimates from coal extraction, post-mining estimates were also determined. Tier 2 methodologies were used because emission factors associated with Rocky Mountain coal were available.

Alternative A assumes 6 mtpy (5.44 million metric tons [mmt]). The IPCC has supplied default emission factors for surface mining with a range of 0.3 to 2.0 m^3 CH_4/metric ton (mt) of coal. Basin specific factors are derived from the in-situ factors, which are based on geologic regions of the U.S. The Colowyo Mine falls into the Rocky Mountain region with an in-situ basin methane emission factor for coal of 0.4 m^3 CH_4/mt. The second component of total surface mining methane emissions is the methane content of the surrounding strata. Total surface mining emissions typically produce twice as much methane as in-situ coal (EPA 2006). The surrounding strata are assumed to also have an emission factor of 0.4 m^3 CH_4/mt resulting in a total factor of 0.8 m^3 CH_4/mt. A factor of 0.67 Gg/10^6 m^3 was implemented as part of the conversion from cubic meters to metric tonnes.

Post-mining coal handling also contributes to overall methane emissions. Again, the in-situ emission factor is applied, but, to avoid overestimates, only the percentage of gas released is included in the calculation. On average, western U.S. coal retains 72 percent of the methane (Kirchgessner et al. 1996). Therefore, 28 percent is released during the post-mining handling process.

After aggregating the two processes (extraction and post-mining) and assuming 5.44 mmt/year coal extraction, the total methane emitted is 3,326 metric tonnes annually. Additionally, the extraction of all 41.7 mmt (43 million short tons) would generate approximately 26,275 metric tonnes of methane.

Mining Combustion Gaseous GHG Emissions

The EPA regulates several GHGs which primarily include CO_2, CH_4, and nitrous oxide (N_2O). There are several other regulated GHGs, such as refrigerants, that are not emitted by the mine. CO_2, CH_4, and N_2O are byproducts of incomplete combustion and are emitted via tailpipe, blasting, and drilling. Each regulated GHG has an associated global warming potential (GWP). GWP was developed to allow for direct comparisons of global warming impacts of different gases. CO_2 is used as the reference gas and therefore has a GWP of 1. According to the EPA, CH_4, and N_2O have GWPs over 100 years of 25 and 298, respectively. All associated GHG emissions are multiplied by each applicable GWP and aggregated together to obtain a final value of CO_2e in units of metric tons.

Utilizing EPA emissions factors and the maximum mining rate of 6 mtpy, the direct GHG emissions associated with Alternative A are detailed **Table 4.3-2**. In 2011, 2,245 mmt of CO_2e were emitted throughout the U.S. according to the EPA NEI database. Also, 130 mmt were emitted within Colorado as stated by the 2014 Colorado Greenhouse Gas Inventory Update. Alternative A would contribute 0.25 percent of the statewide total and 0.014 percent nationwide. In comparison, the amount associated with Alternative A would be insignificant. The emissions contributable to Alternative A would be much smaller when compared to the statewide and national GHG emissions.

Black Carbon Emission Estimates

Black carbon is a significant component of particulate emissions related to incomplete combustion. Haul trucks and locomotive use of diesel fuel are sources of black carbon. As of 2005, 93 percent of all mobile source emissions came from diesel engines (EPA 2012). Black carbon directly absorbs light and reduces the reflection of heat off snow and ice as it gets deposited. Black carbon has been linked to climate impacts such as increased temperatures and accelerated ice and snow melt.

All haul truck types were evaluated for their contribution of black carbon as a percentage of overall particulate (**Table 4.3-3**). All 240T trucks were assumed 830E Komastu haul trucks which all have a "2007-plus" engine. 50T haul trucks are "pre-2007" engines. The EPA has determined black carbon to be a higher percentage of particulate matter when emitted from engines constructed prior to 2007. There is a drastic reduction for newer engines because of better design and use of diesel particulate filters (DPFs). The carbon black percentage of pre-2007 trucks is 78.97 percent compared to 9.98 percent for post-2007 trucks (MOVE 2014). Passenger vehicles also contribute to black carbon emissions, but it is approximately an order of magnitude less.

Table 4.3-2 Direct GHG Emissions (metric tpy), Alternative A

Activity	CO_2	CH_4	N_2O	CO_2e
Scrapers	3,756	0.21	0.10	3,792
Drills	1,973	0.08	0.02	1,980
Dozers	59,236	3.31	1.62	59,801
Graders	33,344	1.87	0.91	33,662
Haul Truck (240T)	28,390	0.01	0.01	28,393
Water Trucks	14,488	0.01	0.01	14,493
Blasting	84,106	2.97	0.79	84,417
Haul Coal to Crusher (50T)	11,891	0.01	0.01	11,895
Access Road	83	0.005	0.01	86
Rail Maintenance	546	0.80	1.98	1,156
Methane Release	--	3,326	--	83,150
Total	237,813	3,335	5.46	322,823

[1] All water trucks use the same engine as the 793C haul trucks; assumes 10 mph speed

[2] Blasting assume 400 tons of ANFO per blast

[3] Assumes an average of 25 gal/hr fuel consumption from Caterpillar Performance Handbook edition 42 - D-11 T tractors medium consumption rate

[4] Assumes an average of 15 gal/hr fuel consumption from Caterpillar Performance Handbook edition 42 - 24 M graders medium consumption rate

[5] Assumes an average of 24 gal/hr fuel consumption from Caterpillar Performance Handbook edition 29 - 637E scrapers medium consumption rate; also average speed of 8 mph

[6] Assumes an average of 50 gal/hr fuel consumption from Komatsu Application Handbook Edition 30 - 830E haul truck high consumption rate; also average speed of 25 mph (real time fleet data)

[7] Weststar 6900XD; average speed of 25 mph; 120 gallon tank assumed to be filled after each 10 hr shift - 12 gal/hr fuel consumption

[8] Assumes 1200 gal diesel consumed per day; 800 maximum holes drilled per day

Table 4.3-3 Black Carbon Emissions (tpy) from Haul Trucks, Alternative A

Haul Truck	Black Carbon $PM_{2.5}$	Black Carbon PM_{10}
50 Ton	0.131	0.154
240 Ton	0.095	0.104
Access Road	7.15E-04	7.73E-04

4.3.1.3 Air Quality Environmental Controls for Direct Emissions from the Mine

Roads

Colowyo employs a dust suppression program for in-pit roads and other unpaved roads, which primarily involves periodic watering. As needed, mine water trucks spray water along the roadway to mitigate dusty conditions. During the dryer months of the year, the water trucks wet down active roadways a minimum of two or three times per shift. If watering of the roadways is not adequate to control dust, a chemical dust suppressant may be applied to the primary in-pit roads to aid in dust suppression during the dryer months. Colowyo surfaces in-pit roads with crushed rock; in-pit roads would not be paved with asphalt. The out-of-pit haul roads are paved with asphalt to provide for dust control.

A strict speed control is implemented for all roads to control dust and to provide for safe operation of the equipment. Travel of unauthorized vehicles is prohibited *on the mine property*, and overburden haul equipment is restricted to roads with appropriate capacity and structure for the equipment size and weight. In addition, most haul road embankment slopes and adjacent areas are mechanically stabilized and seeded with a reclamation seed mixture. Mechanical stabilization consists of furrowing, chiseling, "cat tracking", and mulch, depending on accessibility to the slopes, and prevents dust formation from erosion and wind exposure.

Coal Crushing Facility

The coal crushing and conveying operations at the primary crusher and the Gossard loadout have been equipped with water spraying systems at all coal transfer points. *Water sprays have* been installed at the primary crusher to prevent excessive dust emissions. The secondary crusher at the Gossard Loadout has a baghouse to control coal dust emissions. A stacking tube with metal doors is also used to minimize coal dust emissions at the 100,000-ton crushed coal stockpile. These air quality control measures at the coal crushing handling and loadout facilities have been approved by the CDPHE.

Colowyo maintains several areas for coal storage near the *in-pit crusher* and also near the Gossard Loadout. Inactive storage piles have been sloped and compacted to prevent wind erosion and spontaneous combustion. If coal dust becomes a problem in the active coal storage piles, a mobile water truck with a high pressure pump and nozzle is available for dust suppression.

Disturbance

Colowyo, to the extent practical, minimizes the area of land disturbed at any one time. Topsoil is removed only to the extent necessary to accommodate the mining operations. The re-handling of both topsoil and spoil material is kept to a minimum. Reclamation of disturbed areas commences as contemporaneously as possible. As necessary, a mobile water truck is assigned to work in topsoil or spoil removal areas to keep any dusty conditions under control.

4.3.1.4 Indirect Combustion Criteria Impacts

The number and location of coal customers for the mine has varied annually and over time. Coal is a commodity, and the use of the coal from the mine would depend on a number of factors including demand, price, quality, and transportation, among others.

Colowyo has historically provided coal to a variety of end users, both regionally and nationally. Since 1977 (the beginning of coal sales records), Colowyo has provided coal to approximately ninety different end users all over the nation. In recent years (2009 to present), Colowyo has sold between 66 percent and 99 percent of their coal to the Craig Generating Station. The average annual sales to the Craig Generating Station between 2007 and 2014 were 2.3 mtpy. This represents approximately 48 percent of the 4.8 mtpy required for the Craig Generating Station's annual average combustion needs.

The trend towards supplying coal exclusively to the Craig Generating Station seen in the 2007 to present timeframe is a deviation from historical coal sales within which Colowyo sold coal to a much wider array of end users. Although ongoing coal sales to the Craig Generating Station is likely to continue in the future, with increased coal mining rates as proposed under Alternative A, the relative percentage of Colowyo coal being shipped to the Craig Generating Station would be reduced and a coal distribution more consistent with the longer historical sales record would likely return.

The mine is connected to a main rail line via a private rail spur that connects to the coal load out facility at the mine and runs north to Craig where it intersects with the Moffat Tunnel line. The latter line then connects to two east-west rail lines 80 miles *(129 km)* southeast of Craig in Eagle County. Coal heading east of this intersection will pass through the Moffat Tunnel and deliver coal to the eastern slope of Colorado. Coal heading west of this intersection will join with a major east-west rail line that delivers coal throughout the country.

The mine has an existing contract *based on quality of coal (million British thermal units)* with the Craig Generating Station to *which they* provide *approximately* 2.3 mtpy; this contract expires in 2017. For the reasons listed above, it is difficult to project exactly how much coal from the mine would be burned at any particular power plant at any given time in the future.

In addition to the reasonably foreseeable combustion of coal at the Craig Generating Station, coal provided by the mine is particularly economically viable for regional generating facilities due to the reduced cost of transport. As a result, the Hayden Generating Station is also a reasonably foreseeable future user of coal from the Colowyo Mine. Using the Craig and Hayden Generating Stations as reasonably foreseeable locations for the combustion of coal produced at the mine, criteria pollutant emissions from coal combustion at these facilities (**Table 4.3-4**) can be used to calculate emissions associated with coal from the Colowyo Mine. Power plant emissions are analyzed and regulated by state and tribal governments to determine whether impacts will cause or contribute to violations of federal and state/tribal ambient air quality standards. Federal and state rules for power plant emissions address hazardous and toxic air pollution from power plants to protect public health and the environment.

Table 4.3-4 Reporting Year 2014 Criteria Emissions Data

Facility	2014 (reporting year) Annual Actual Pollutant Emissions (tpy)					
	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
Craig Generating Station	172.2	121.1	1232.8	12091.0	3261.0	62.2
Hayden Generating Station	148.3	67.5	385.1	6483.6	2330.7	49.2

Source: APENS

The maximum coal produced under Alternative A would be 6 mtpy, so this maximum production was used to conservatively estimate annual criteria pollutant emissions (**Table 4.3-5**). Emissions were also calculated for the current maximum contracted coal tonnage. These rates may vary significantly from year to year, but are useful for determining a general estimate of criteria pollutant emissions. Emissions are calculated based on the highest regional emission rate (regional maximum), the average regional emissions rate (regional average), and using the Craig Generating Station emissions factors.

Table 4.3-5 Predicted Criteria Emissions Data Based on Regional Maximum, Average, and Craig Generating Station Only Emissions Rates

Emissions Method	Coal Combustion Rate (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy	CO (tpy)	NO^2 (tpy)	SO^2 (tpy)	VOC (tpy)
Regional Maximum							
Maximum Mining	6,000,000	507.58	231.15	1817.16	22,196.57	7,979.14	168.44
Contracted Rate	2,300,000	194.57	88.61	696.58	8,508.69	3,058.67	64.57
Regional Average							
Maximum Mining	6,000,000	380.72	204.81	1567.78	20,009.44	6,392.95	130.05
Contracted Rate	2,300,000	145.94	78.51	600.98	7670.28	2,450.63	49.85
Craig Generating Station Only							
Maximum Mining	6,000,000	253.85	178.47	1,817.16	1,7822.30	4,806.76	91.67
Contracted Rate	2,300,000	97.31	68.41	696.58	6831.88	1,842.59	35.14

The Hayden Station emission rates produce the highest PM_{10}, $PM_{2.5}$, SO_2, VOC, and NOx emission rates of the two facilities while the Craig Generating Station had the highest emission rate for CO. **Table 4.3-6** presents the relative percentage of the 2011 EPA NEI for Colorado that the predicted emissions represent. Emissions for all sources in Colorado were compared to the emissions presented above.

Emissions at the maximum mining rate would range from 0.02 percent to 8.63 percent of the Colorado total NEI emissions and from 0.03 percent to 14.33 percent based on regional maximum emissions calculations (**Table 4.3-6**). It should be noted that these values are highly conservative and would exceed the annual coal combustion rate at either the Craig or Hayden

Generating Stations which are approximately 4.8 and 2.0 mtpy, respectively. Emissions at the maximum mining rate would range from 0.00029 percent to 0.1428 percent of the national total NEI emissions and from 0.00016 percent to 0.115 percent based on regional maximum emissions calculations (**Table 4.3-6**). The emissions would be insignificant relative to the national emissions totals and moderate emissions relative to the Colorado emissions total.

Emissions at the maximum mining rate when compared to the four surrounding counties would range from 0.1 percent to 118.3 percent. As stated above, the assumed 6.0 mtpy is a very conservative combustion rate and not representative of current rates at either generating station. Emissions under the contracted rate of 2.3 mtpy would range from 0.1 percent to 45.3 percent of the surrounding county total emissions. These would be substantial contributions associated with the two generating stations, but the regional designation regarding NAAQS compliance would not change and remain in attainment. As described in **Section 4.3.2.4**, the state monitoring network has shown compliance with the NAAQS when natural exceptional events are excluded.

Table 4.3-6 Predicted Criteria Emissions Data Based on Regional Maximum, Average, and Craig Generating Station Only Emissions Rates

Emissions Method	Coal Combustion Rate (tpy)	PM_{10} (% of 2011 NEI)	$PM_{2.5}$ (% of 2011 NEI)	CO (% of 2011 NEI)	NO_2 (% of 2011 NEI)	SO_2 (% of 2011 NEI)	VOC (% of 2011 NEI)
Regional Maximum							
Maximum Mining	6,000,000	0.15	0.23	0.13	7.30	14.32	0.03
Contracted Rate	2,300,000	0.06	0.09	0.05	2.80	5.49	0.01
Regional Average							
Maximum Mining	6,000,000	0.12	0.20	0.11	6.58	11.47	0.02
Contracted Rate	2,300,000	0.04	0.08	0.04	2.52	4.40	0.01
Craig Only							
Maximum Mining	6,000,000	0.08	0.18	0.13	5.86	8.63	0.02
Contracted Rate	2,300,000	0.03	0.07	0.05	2.25	3.31	0.01

<u>Indirect Coal Combustion GHG and Climate Change Impacts</u>

In 2010, in an attempt to assess GHG emissions on a facility, regional and national level, the EPA introduced the Greenhouse Gas Reporting Program (GHGRP). The program collects GHG data from forty-one source categories. GHGRP data includes direct emissions from large stationary sources, accounting for approximately half of total U.S. GHG emissions, and also data from suppliers of materials that would result in GHG emissions when those materials are burned or released. Most industries began reporting for 2010; additional industries began reporting for 2011. The regulations that introduce the GHGRP also provided a standardized means to assess and calculate GHG emissions. These calculation methods were codified in 40 CFR Part 98. For the calculation of combustion emissions the methods are included in subpart C of that regulation. These emissions calculations are an approved method for tabulating GHG pollutant emissions for the most common GHG pollutants. The emissions are not dependent on emissions location or combustion type and provide both speciated and CO_2e emissions. CO_2e is a quantity that describes, for a given mixture and amount of GHG, the amount of CO_2 that would have the same GWP, when measured over a specified timescale (generally, 100 years). CO_2e thus reflects the time-integrated radiative forcing of a quantity of emissions or rate of GHG emission—a flow into the atmosphere—rather than the instantaneous value of the radiative forcing of the stock (concentration) of GHGs in the atmosphere.

The CO_2e for a gas is obtained by multiplying the mass and the GWP of the gas. According to EPA, CH_4 and N_2O have GWPs over 100 years of 25 and 298, respectively. This means that emissions of 1 million metric tonnes of methane and nitrous oxide respectively is equivalent to emissions of 25 and 298 million metric tonnes of CO_2.

The USEPA provides prepopulated spreadsheets for the calculation of stationary fuel combustion, which are based on their approved methodologies for GHG reporting. For Alternative A, these spreadsheets were used to assess the total GHG emissions associated with combusting the coal produced by the mine both in terms of the maximum annual rate of mining and the maximum total coal recovery.

The following GHG emissions would be generated from the coal mining rates under Alternative A (**Table 4.3-7**).

Table 4.3-7 GHG Coal Combustion Emissions, Alternative A

Coal Combusted (Short Tons)		CO_2 Emissions (metric tonnes)	CH_4 Emissions (metric tonnes)	Total CH_4 in CO_2e (metric tonnes)	N_2O Emissions (metric tonnes)	Total N_20 in CO2e (metric tonnes)	Total CO_2e (metric tonnes)
43,000,000	Proposed Total Mine Tonnage	99,995,227	11,792	294,797	1,715	511,125	100,801,149
6,000,000	Proposed Maximum Annual Mine Tonnage	13,952,822	1,645	41,135	239	71,320	14,065,277

The values detailed in **Table 4.3-7** represent two separate components. The first presents the total GHG emission impacts from the combustion of all coal under Alternative A. These emission impacts would occur over the life of the mine until 2017. The second represents the maximum annual emissions assuming that all mined coal (at the maximum mining rate) is combusted in one year.

Based on maximum annual GHG emission impacts, the GHG emissions associated with coal combustion under Alternative A would represent 0.048 percent of estimated global emissions and 0.231 percent of estimated U.S. net emissions at the maximum mine rate; these emissions would be negligible. It should be noted that these rates exceed the historical utilization rate of Colowyo coal at the Craig Generating Station and as such exceed the emissions historically generated. Finally, given that the causal link between an individual GHG emissions source and global climate change impact is not a direct relationship, the results of these emissions on final climate change impacts is unknown.

Regardless of the accuracy of those emission estimates, predicting the degree of impact that 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. No tools or scientifically defensible analysis methods exist to describe the degree to which any observable changes can, or would be, attributable to Alternative A. As such, the extent of impact that emissions resulting from continued mining may have on global climate change, as well as the accompanying changes to natural systems, cannot be accurately quantified (US GCRP 2009).

To provide some additional context, the EPA has recently modeled global climate change impacts from a model source emitting 20 percent more GHGs than a 1,500 MW coal-fired steam electric generating plant (approx. 14,132,586 metric tons per year of CO_2, 273.6 metric tons per year of NO, and 136.8 metric tons per year of methane). It estimated a hypothetical maximum mean global temperature value increase resulting from such a project. The results ranged from 0.00022 and 0.00035 degrees Celsius occurring approximately 50 years after the facility begins operation. The modeled changes are extremely small, and any downsizing of these results from the global scale would produce greater uncertainly in the predictions. The EPA concluded that even assuming such an increase in temperature could be downscaled to a particular location, it "would be too small to physically measure or detect" (Letter from Robert J. Meyers, Principal Deputy Assistant Administrator, Office of Air and Radiation re: "Endangered Species Act and GHG Emitting Activities [Oct. 3, 2008]). The Project emissions are a fraction of the EPA's modeled source and are shorter in duration, and therefore it is reasonable to conclude that the Project would have no measurable impact on the climate.

Although it is impossible to connect a single emitter of GHGs to the degree of impact that emitter may have on global climate change, EPA (2015b) has predicted that Colorado will experience the following general trends related to climate change:

- The region will 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 will result in earlier peak stream flows, 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 patters 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.

Social Cost of Carbon

The EPA and other federal agencies use the social cost of carbon (SCC) to estimate the climate benefits of rulemakings. The SCC protocol was also developed for use in cost-benefit analyses of proposed regulations that could impact cumulative global emissions (Shelanski and Obstfeld 2015). The SCC is an estimate of the economic damages associated with an increase in CO_2 emissions. This is typically expressed as 1 mt in a single year. This dollar cost figure from this calculation represents the value of damages avoided for an associated carbon emissions reduction.

The SCC is meant to be an estimate of climate change damages and includes, but is not limited to, changes in net agricultural productivity, human health, and property damages from increased flood risk. However, given current modeling and data limitations, it cannot include all damages or benefits.

Based on emission estimates for coal combustion, SCC calculations can quickly rise to large values; however, specific threshold levels for the determination of significance can vary depending on numerous project factors. NEPA does not require a cost-benefit analysis or the presentation of the SCC cost estimates quantitatively. Without a complete monetary cost-benefit analysis, which includes the social benefits of energy production, inclusion solely of a SCC analysis would be misleading. Therefore, OSMRE did not apply the SCC protocol in this analysis. GHG coal combustion emissions are quantified and contextualized against global and national GHG emissions above.

Ozone *Precursor Emissions* Impacts

Ozone (O_3) can be found in the earth's atmosphere at both ground level and the upper regions. Upper atmospheric O_3 is also known as the O_3 layer, and protects earth's surface from the sun's rays. Ground level O_3 is the main component of smog and is considered a harmful pollutant.

Ground level O_3 is not emitted directly into the air but is created by chemical reactions between NOx (NO and NO_2) and VOCs in the presence of heat and sunlight (EPA 2015b). The most significant chemical reaction driving the formation of ground level O_3 is photolysis of NO_2; however, this process is reversed by the reaction of NO with O_3. Therefore, the formation of O_3 due to NOx is dependent on the NO_2 to NO ratio and, by itself, would result in very low levels of O_3 formation. The net effect of the nitrogen cycle is neither to generate nor destroy O_3 molecules. Moreover, for O_3 to accumulate, an additional pathway is needed to convert NO to NO_2; one that will not destroy O_3. The photochemical oxidation of VOCs, such as hydrocarbons and aldehydes, provides that pathway (CARB 2015). When VOCs are present, they form radicals which convert NO to NO_2 and, thus, increase the formation of O_3.

The relative amounts of VOCs and NOx at a particular location, in addition to climatological conditions, will determine whether the NOx behaves as a net O_3 generator or a net ozone inhibitor. When the VOC/NOx ratio in the ambient air is low, NOx tends to inhibit O_3

formation. In such cases, the amount of VOCs tends to limit the amount of O_3 formed, and the O_3 formation is called "VOC-limited". When the VOC/NOx ratio is high, NOx tends to generate O_3. In such cases, the amount of NOx tends to limit the amount of O_3 formed, and O_3 formation is called "NOx -limited"(CARB 2015).

Precursors of O_3 including NOx and VOCs are generated by *both direct and indirect sources. The vast majority of precursor emissions are derived from coal combustion and to a lesser degree, onsite blasting (as a direct impact of mining).* Based on the combustion at the Craig Generating Station at either the Alternative A maximum coal mining rate (6 mtpy) as well as at the reasonably foreseeable contracted coal combustion rate (2.3 mtpy), conservative estimates of O_3 precursors are included in **Table 4.3-8**.

Table 4.3-8 Predicted Ozone Precursor Emissions Rates Based on 2013 Craig Generating Station Factors *and Blasting Emissions*, Alternative A

Emissions Method	Coal Combustion Rate (tpy)	NO_X (tpy)	VOC (tpy)
Craig Only	6,000,000	*17,822.30*	91.67
Craig Only	2,300,000	*6,831.88*	35.14
Blasting	*Not applicable*	*1,736.30*	*0.37*

Although O_3 precursor emissions from the combustion of coal *and onsite blasting* can be significant, current rates of coal combustion from regional generating facilities and other sources of O_3 precursors have not resulted in ambient O_3 concentrations that have exceeded the NAAQS.

Regional O_3 NAAQS Compliance

CDPHE provides statewide annual air quality reports for NAAQS comparison and subsequent attainment/nonattainment designation. Prior to 2012, Colorado was divided into five multi-county areas that were generally based on topography. These include: the Eastern Plain, the north Front Range, the Southern Front Range, the Mountain Counties and the Western Counties. The divisions are groupings of monitoring sites with similar characteristics. The area most similar and geographically-near the Project Area is the Western Counties. The Western Counties generally contain smaller towns located in fairly broad river valleys. Ten counties comprise the Western Counties. The counties geographically from north to south are: Moffat, Rio Blanco, Garfield, Mesa, Delta, Montrose, San Miguel, Dolores, Montezuma, and La Plata. Starting in 2012, Montezuma and La Plata counties were removed and integrated into a new monitoring area (Southwestern). The remaining eight counties and Ouray County are now part of the Western Slope monitoring area. All annual reports from 2007 to 2014 were evaluated for potential regional NAAQS exceedances and/or violations. The 2014 report has not yet been completed, but 2014 ozone data was provided by CDPHE.

Direct combustion rates at both the Craig and Hayden Generating Stations are not proposed to change in the foreseeable future. Therefore, the most recent regional monitoring data

(2014) is representative of Alternative A. **Table 4.3-9** outlines the regional O_3 concentrations at three monitoring sites. The current O_3 standard is 0.075 ppm.[6]

Table 4.3-9 2014 Western Slope Ozone Monitor Concentrations

Site Name	Location	Ozone 8-hr Avg (parts per million [ppm])		
		1st Maximum	4th Maximum	3-yr Avg of 4th Max. (2012-2014)
Garfield County				
Rifle	195 14th St.	0.062	0.061	0.063
Mesa County				
Palisade Water Treatment	865 Rapid Creek Dr.	0.064	0.062	0.066
Moffat County				
Lay Peak	17820 CR 17	0.067	0.062	0.064

O_3 standards are based on the 4th high value averaged over a three year period for the 8-hr averaging period. For all monitor locations the ambient concentration values indicate that the region is in compliance with the O_3 NAAQS suggesting that reasonably foreseeable rates of coal combustion emissions for Alternative A would not produce exceedances of the NAAQS.

Indirect Mercury Impacts

Description of Potential Mercury Emissions Generated by Coal Combustion

In order to describe the total potential mercury emissions that can be generated by mined coal, one must have representative data for the quality and characteristics of the coal as well as the control strategies and equipment utilized at the final combustion location. In the period from 2007 to present, Colowyo has provided most of their mined coal to the Craig Generating Station. During the period from 2007 to present, the Craig Generating Station has provided actual mercury emissions from all onsite atmospheric emission sources via the USEPA's Toxic Release Inventory (TRI) program.

TRI tracks the release of certain toxic chemicals that may pose a threat to human health and the environment. U.S. facilities in different industry sectors must report annually how much of each chemical is released to the environment and/or managed through recycling, energy recovery, and treatment.

Mercury emissions for the Craig Generating Station were reported by the facility for all atmospheric emissions sources. **Table 4.3-10** presents the actual mercury emissions that were reported by the facility.

[6] *On November 25, 2014, the EPA proposed an updated ground-level O3 standard. Based on scientific evidence, both standards would have an average period of eight hours within the 65 to 70 parts per billion (ppb) range.*

Table 4.3-10 TRI Reported Atmospheric Emissions for the Craig Generating Station

Reporting Year	Hg Emissions (lbs/year)
2007 TRI	130
2008 TRI	130
2009 TRI	30
2010 TRI	43
2011 TRI	43
2012 TRI	44
2013 TRI	42.4

Emissions for the Craig Generating Station have changed significantly throughout the period from 2007 to 2013. This is a result of the installation of mercury emissions controls at the facility.

Using the reported TRI emissions and the coal combusted at the Craig Generating Station reported during that period, an emissions factor can be calculated for a pound of mercury per ton of coal combusted. Based on the calculated emissions factors mercury emission impacts vary significantly between the emissions controls in place in 2007 at the Craig Generating Station and the emissions controls in place in 2013. The resultant mercury emissions impacts are provided in **Table 4.3-11**.

Table 4.3-11 Potential Coal Combustion Mercury Emissions Using Craig Generating Station TRI Actual Emissions

Coal Production	Emission Factor (Derived from 2007 TRI)	Emission Factor (Derived from 2013 TRI)	Total Predicted Hg Emissions (Derived from 2007 TRI)	Total Predicted Hg Emissions (Derived from 2013 TRI)
43 MT (Project Total)	2.58292E-05 (lbs/ton combusted)	9.20858E-06 (lbs/ton combusted)	1,110.65 (lbs Hg)	395.97 (lbs Hg)
6 mtpy (Maximum Annual Production)	2.58292E-05 (lbs/ton combusted)	9.20858E-06 (lbs/ton combusted)	154.98 (lbs Hg/year)	62.24 (lbs Hg/year)

Based on data available from the TRI data explorer, the electrical generation sector in Colorado generated approximately 1,070 lbs of mercury emissions for reporting year 2013. The Craig Generating Station emissions would represent approximately 5 percent of the state mercury emissions if 6 mt of Colowyo coal was combusted in one year. This rate exceeds the maximum firing rate at the Craig Generating Station. The 2011 NEI information for electric generating coal facilities in Colorado indicates that 745.8 lbs (0.37 tons) of mercury were emitted from coal facilities. The 62.24 lbs/yr described above from the 2013 TRI is 8.3 percent.

The more recent emission rate is representative into the future because of MATS compliance. The national mercury total is 25.6 tons; thus the Craig Generating Station would contribute 0.12 percent which would be negligible.

Finally, a mercury deposition network (MDN) monitoring site is located adjacent to the air quality study area in Routt County just east of Steamboat Springs. This site has provided data to the MDN since 2007. The MDN site measures mercury deposition from all sources and does not have the ability to specify the particular source of mercury. Based on mapped mercury deposition products from the MDN, the regional air quality study area has seen little change in total average mercury wet deposition during the period from 2007 through 2013. Given that regional coal combustion is not likely to increase as a result of Alternative A, the total deposition would be likely to remain consistent with the mapped data from 2013. It should be noted, however, that deposition monitoring values for total wet deposition at the Routt Monitoring Station increased approximately 2μg/m2 from 7.8 μg/m2 in 2008 to 9.8 μg/m2 in 2013 even in the face of declining regional mercury emissions. This is likely a result of refined monitoring methods and not a reflection of increasing mercury deposition. *Mercury deposition has a global reach and can be transported far away from its originating location. Thus, global transport could be the cause of increasing overall mercury deposition even with declining regional emissions. Mercury deposition has a global reach and can be transported far away from its originating location. Thus, global transport could be the cause of increasing overall mercury deposition even with declining regional emissions (EPRI 2014).*

4.3.1.5 Indirect Railroad Emission Estimates

<u>Coal Transporting</u>

Coal transportation emissions were calculated for the indirect effect of coal movement via rail. The maximum emissions from railroad coal transportation are based on an annual shipping rate of 6 mtpy. The mass of coal per railcar is 100 tons, and a coal train is normally comprised of 110 railcars. That equates to 11,000 tons of coal per rail shipment. The *estimated* maximum number of annual shipments is 545. An engine load was estimated from the force required to move the total train weight (4 engines per train and 4,000 brake horsepower (bhp)/engine). Each engine is Tier 4 compliant.

Locomotives also contribute to black carbon emissions similar to the haul trucks discussed in **Section 4.3.1.2**. Explicit PM_{10} black carbon emissions associated with rail operations are included in **Table 4.3-12.**

The one-way haul distance is 28 miles (45 km) with an assumed maximum allowable speed of 80 mph for freight trains. Emissions were calculated for the round trip assuming this distance each direction. This distance represents a conservative estimate of the length of the mine's rail spur which is the only portion that can be accurately estimated. Based on that scenario, the maximum annual operating hours of the train is 382. Emissions are determined by the annual power usage, which is 6.1 million bhp-hours. **Table 4.3-12** outlines the criteria pollutant emissions, HAP emissions, and GHG emissions associated with coal transportation by rail.

Railroad Maintenance

In addition to transport, railroad maintenance activities also produce indirect emissions. Each railroad maintenance action typically occurs once per year and runs for a duration of approximately four weeks. During the four week maintenance period each piece of equipment ranges in usage from six days to three weeks. All equipment is operated by diesel engines each of which are EPA Tier certified ranging from Tier 1 to Tier 4. **Table 4.3-12** outlines the emissions that would be associated with a four week maintenance project under Alternative A.

Table 4.3-12 Railroad Coal Transportation and Railroad Maintenance Emission Estimates (tpy)

Source	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2	HAPs	GHG[1]	Black Carbon[2]
Coal Transportation	0.1	0.1	6.7	8.6	0.3	0.03	0.02	3,284	0.3
Railroad Maintenance	0.1	0.1	0.5	0.5	0.1	0.1	1.5E-02	605	0
Total	0.2	0.2	7.2	9.1	0.4	0.1	0.04	3,889	0.3

[1] Greenhouse gas emissions are presented as CO_2e metric tonnes per year.
[2] Black carbon is a component of particulate. Therefore, total PM_{10} and $PM_{2.5}$ would equate to 0.5 and 0.4 tons/yr, respectively with black carbon included.

All criteria pollutants and HAP emissions associated with railroad activities were compared to the county data from the 2011 NEI. Alternative A would contribute a maximum of 0.0164 percent of all criteria pollutants and 0.0405 percent of all HAPs emitted within Garfield, Moffatt, Rio Blanco, and Routt counties. The indirect emissions from railroad activities under Alternative A would be insignificant when compared to total HAPs emitted in the surrounding counties.

4.3.2 Alternative B – PR02 as Revised

All air quality analyses from 2007 to 2014 assume actual throughput values associated with the mine. Ambient air quality analysis conducted for 2014 assumed a maximum annual coal throughput of 4 mtpy. Operations in 2014 are considered a maximum emissions scenario because subsequent years are expected to produce less coal through the life of the mine to 2019. Eleven actual operational scenarios were simulated to demonstrate all foreseeable realistic equipment combinations.

4.3.2.1 Previous Impacts

Emission Estimates – Mining Activities (2007-2014)

Colowyo is required to submit air emissions information to CDPHE a minimum of every five years through the submission of Air Pollution Emission Notices (APEN). The information submitted via APEN includes particulate emissions. Other emissions such as GHGs and HAPs, as well as emissions associated with transport of the coal via rail from the mine to the Craig Generating Station, were established using actual equipment data.

APEN Particulate Data

APEN data was supplied to CDPHE in 2007, 2009, 2012, and 2013 for the timeframe of interest (2007-2014). All APEN data is compared to applicable permit limitations associated with the mine. Colowyo submits up to nine individual APEN forms during each submittal year. **Table 4.3-13** provides specific activities associated with each APEN.

Table 4.3-13 APEN Activity Breakdown

APEN #	CDPHE Category	Activities
21	Fugitive Mining	Blasting
		Scrapers
		Drilling
		Shovels
		Draglines
		Loaders
		Dozers
		Graders
		Haul trucks
		Water trucks
		Pit Erosion
		Loading/unloading
22	Primary Crusher	Unloading Coal to hopper
		Primary Crushing
		Convey to Storage Bins
		Loading to belly dump trucks
23	Secondary Crusher	Haul coal to crusher
		Unloading coal
		Secondary Crushing
		Convey to stacking tube
		Storage pile at tube
24	Rail Loading	Railcar Loading
25	Storage pile/Reclaim	Storage pile at 2nd crusher etc.
26	Auxiliary Coal System	Aux coal loading/unloading
		Aux coal crushing
		Aux coal loading to truck
		Aux coal loaded to truck to market
27	Coal Auxiliary Handling	Unloading to railcar siding
		Loading w/ FELs to railcars
28	Rock/Haul Road Maintenance	Rock hauling/loading to crusher
		Crushing/screening
		Rock storage piles
29	Material Handling	Hauling/storing rock from crusher

Table 4.3-14 identifies the maximum annual particulate emissions from 2007 to 2014 that contributed to Colorado emissions.

Table 4.3-14 Maximum APEN Particulate Estimates from 2007-2014

APEN	Emission Source	PM (T/yr)	PM_{10} (T/yr)	$PM_{2.5}$ (T/yr)
21	Fugitive	5304	1334	392.4
22	Primary	26.2	8.3	1.8
23	Secondary	8.3	6.8	1.8
23	Haul trucks	807	158	3.2
24	Railcar	0.1	3E-02	4E-03
25	storage/reclaim	13.3	6.7	2.0
26	Auxiliary coal sys	3.1	0.9	0.4
26	coal load/unload	2.2	0.4	0.1
27	load/unload/haul	1.2	0.6	0.1
28	crusher/screens	3.0	1.1	0.2
28	loaders/haul road	4.0	1.2	0.4
29	Haul/storage rock from crusher	0.8	0.3	5E-02
	Total	6,173	1,518	402

The maximum particulate emissions associated with Alternative B were established in 2012 primarily due to fugitive emissions. An aggregated total of 2012 APEN information shows that $PM_{2.5}$ and PM_{10} emissions were 402.5 and 1,518.3 T/yr, respectively. Compared to the state and national NEI data, Alternative B contributed 0.4 percent and 0.46 percent of Colorado's particulate emissions for $PM_{2.5}$ and PM_{10}. National contributions were 0.006 percent and 0.007 percent, respectively. These percentages are insignificant by comparison to statewide and national totals.

County comparisons to the 2011 NEI data suggest that the maximum particulate emissions potential associated with Alternative B are 6.9 percent. This is considered moderate, but the region still maintained its attainment designation by the EPA and CDPHE.

<u>Onsite (North and Gossard) Particulate Monitoring Data</u>

In addition to emissions data, the mine has collected ambient air quality concentration data for atmospheric particulates smaller than 10 microns. Data is collected at two sites, known as the Gossard and North sites (**Section 3.3**), *using federal equivalent method (FEM) monitors. FEM monitors onsite are not used for attainment/nonattainment determination by CDPHE and the EPA. Therefore, the data obtained by these monitors is not directly used for NAAQS compliance purposes. The following discussion outlines the monitored high value events and their comparison to the standard. However, note that a high monitored value does not correlate to a NAAQS violation.*

The Gossard location particulate monitoring data is provided from July 2011 through December 2013. The North location particulate monitoring data was split into three, three-year segments for evaluation against the NAAQS standard (**Table 4.3-15**) as the standard is based on a three year averaging period of concentrations.

Table 4.3-15 Monitoring Station Potential *High Values*, Alternative B

Station	3-Year Timeframe	Total Daily Values ≥ 154.4 µg/m3
North	Aug 2008-July 2011	8
	Aug 2009-July 2012	4
	Aug 2010-July 2013	2
Gossard	July 2011-Dec 2013	1

Between August 2010 and July 2013, 24-hr PM_{10} concentrations at the North monitor *show high values* two times; between July 2011 and December 2013; concentrations at the Gossard monitor *are elevated* once. However, the NAAQS standard allows for one exceedance per year on average over the three year period. Therefore, because the total number of exceedances was less than three for each of the above mentioned segments, those are not considered NAAQS violations.

The August 2008 through July 2010 and August 2009 through July 2010 North monitoring segments have an overlapping time period of two years (August 2009 – July 2010). As a result, any exceedances that occurred between August 2009 and July 2010 are double counted. There were eight total *high values* between August 2008 and July 2011 (**Table 4.3-16**). The number of *monitored high values* therefore was greater than the allowed standard of no more than one exceedance per year averaged over three years.

Table 4.3-16 *High Value* Dates

Station	Date of Exceedance	24 HR Average (µg/m^3)
North	11/2/2008	299.00
	3/4/2009	233.44
	3/22/2009	170.84
	7/6/2009	156.64
	9/29/2009	283.76
	9/30/2009	266.78
	12/4/2009	184.76
	5/28/2010	203.59
	5/26/12	199.42
Gossard	5/26/12	199.42

During review of particulate emission sources at the mine site, two primary direct causes of these *high values* were discovered. On each of the days *a high value* occurred, operational activities occurred in close proximity to the R3 coal stockpile. The nine exceedances between August 2008 and July 2013 also coincided with climatic conditions conducive to excessive fugitive dust formation.

The main contributors of particulates to the *high values* at the North monitor were likely the activities associated with the R3 coal stockpile. Scanning Electron Microscopy (SEM) analysis of the North monitor filter resulted in approximately 25.2 percent of the particulate mass on the filter being comprised of carbon-based material, suggesting coal dust as the particulate source. This confirmed the assumption that dust from the R3 coal stockpile significantly contributed to the *high values* at the North monitor.

In order to prevent further air quality issues Colowyo developed a Dust Mitigation Plan (Colowyo 2010a), aimed at minimizing future particulate emissions.

Since implementation of the Dust Mitigation Plan only one *high value* event has been recorded at the North monitor. In addition, many of the *monitored high values* associated with the mine can be attributed to an exceptional event. An exceptional event is determined by the EPA and can include natural phenomena such as high winds and wildfires, which may apply to the Colowyo Mine. On March 22, 2007, the EPA promulgated the current Exceptional Events Rule (EER, 40 CFR 50 and 51). According to this rule, exceptional events are unusual or naturally occurring events that can affect air quality, but are not reasonably controllable or preventable using approved mitigation techniques that state and local air quality agencies have implemented in order to attain and/or maintain the NAAQS. These events are flagged as exceptional events and are not used in the determination of NAAQS attainment status.

Elevated PM_{10} Events at North Site

The eight exceedance events (**Table 4.3-16**) were addressed by Colowyo in a Mitigation Modeling Report issued in June 2010 (Colowyo 2010b). Although it was determined that the primary contributor to the eight *high values* that occurred between 2008 and 2010 were coal dust emissions from the R3 stockpile and fugitive dust from the maintenance/parking area, three of those events could possibly be considered exceptional events.

High Concentration Days Evaluation

Table 4.3-17 illustrates a summary of the three 24-hr PM_{10} *high value* days which can potentially be identified as exceptional events. The table identifies the average and maximum wind speed on the days the exceedances occurred.

Table 4.3-17 High Wind Days

Station	Date of Exceedance	Average Wind Speed (meters/second [m/s])	Maximum Wind Speed (m/s)
North	11/2/2008	8.2	12.5
	9/29/2009	7.3	9.2
	9/30/2009	8.2	14.6

The EPA guidance for exceptional events identifies a wind speed threshold of 11.2 m/s (25 mph). The maximum wind speeds for November 2, 2008 and September 30, 2009 exceed the 11.2 m/s threshold (**Table 4.3-17**). This occurred for two of the six hours when the NAAQS were exceeded during November 2, 2008 and three of the six hours during September 30, 2009. The hours with highest wind speed correlate with the time when the highest concentrations were observed for November 2008. The correlation does not hold true for September 2009, but during the highest wind hours, the air quality monitor malfunctioned. Had that not occurred, it is likely that the concentrations would have been high. Additionally, all hours for which data was recorded showed a wind speed of greater than the 95th percentile of the EPA threshold for September 30, 2009 and for a third of the hours for November 2, 2008. Therefore, it is reasonable to conclude that for those two days of *high values*, an exceptional event had occurred.

The data suggest some variation for September 29, 2009. The maximum hourly wind speeds do not meet the 11.2 m/s threshold, nor do any exceed the 95th percentile. However, unlike the other two events that were evaluated, there was not a significant variance and standard deviation of the wind speeds. Both November 2, 2008 and September 30, 2009 were relatively calm days with only a handful of hours with very high winds, while September 29, 2009 had consistent winds for the entirety of the day.

With the mitigation now in place, the removal of stockpile R3, *and chemical stabilization of the maintenance parking lot and boneyard*, the direct emissions associated with Alternative B would be unlikely to produce any *high values* in the future unless there is a regional exceptional event.

Gaseous Criteria Pollutants

Unlike the particulate emissions, APEN data was not available from CDPHE for all gaseous pollutants. Therefore, all emission estimates are based on actual data supplied by the mine. NO_x, CO, SO_2, and VOC emissions from blasting, drilling, and tailpipe exhaust at the mine were evaluated. The equipment that contributes to tailpipe emissions consists of all haul trucks (50 ton capacity, 170 ton capacity from 2007-2010, and 240 ton capacity), scrapers, graders, dozers, and water trucks. Emissions from the scrapers, graders and dozers occur in the South Taylor pit. Hauling either occurs within the pit or along the paved haul road leading to the rail loop.

Direct Gaseous, GHGs, and HAPs Annual Emissions

Emissions for gaseous pollutants, GHGs, and HAPs were calculated for the mine activities that occurred from 2007 to 2014 (**Table 4.3-18**). The emissions calculations utilized activity rates that were provided by Colowyo for the mining that occurred annually during that period.

Table 4.3-18 Maximum Emission Estimates 2007-2014 (tpy)

Emission Unit	SO_2	CO	NO_x	VOC	HAP	GHG[1]
Scrapers	1.68E-04	0.227	0.126	0.148	1.16E-02	481
Drilling	0.013	7.189	27.063	0.913	3.85E-02	1,515
Dozers	0.002	2.856	1.585	6.274	3.20E-01	16,808
Graders	0.001	1.662	0.922	0.331	1.17E-01	2,551
Haul Trucks (170T coal)	0.001	1.427	0.707	0.387	5.74E-02	1,644
Haul Trucks (240T OB/Coal)	0.006	7.607	4.221	2.005	2.97E-01	10,650
Water trucks	0.001	0.700	0.364	0.469	6.96E-02	249
Blasting	0.499	5,575	882	0.161	1.15E-03	36,919
Access Road	0.001	1.172	0.090	3.224	5.00E-02	4,110
Haul coal to Crusher (50T)	0.008	11.889	5.890	0.125	4.78E-01	45
Total	0.532	5,610	923	14.0	1.44	74,972

[1]Greenhouse gas emissions are presented as CO_2e metric tonnes per year.

For all gaseous pollutants (CO, NO_x, SO_2, and VOC) the maximum emission year was selected for comparison to state and national totals. VOC maximums were established in 2007; the other three pollutants in 2009. Previous contributions were in the range of 0.01 percent to *9.8* percent of the surrounding counties gaseous emissions when compared to the 2011 NEI data. The maximum annual emissions ranged from 0.001 percent to 0.4 percent of the statewide total. Nationally, previous contributions ranged from *0.00001* percent to 0.01 percent. Previous gaseous emissions did not contribute significantly when compared to the statewide or national totals.

The operational year of 2007 contributed to the previous maximum HAP emissions. The 1.44 tons comprised 1.7 percent of the surrounding county total and 0.001 percent of the statewide total of 195,455 tons (as reported to the EPA in the 2011 NEI database). Nationally, the contribution was *0.00002* percent. Again, previous contributions were insignificant when compared to state and national totals.

Direct Methane Release Emissions

Under Alternative B, extraction of coal from the South Taylor pit began in 2008 and would cease in 2019. Methane release and post-mining emissions were estimated based on calculations described in **Section 4.3.1.2**. **Table 4.3-19** outlines the methane gas release estimates, reported at CO2e, from coal and overburden for each year from 2008 through 2014 as well as the total methane emissions from 2015 to the end of the mine life.

Table 4.3-19 Annual Methane Emissions 2015-2019, Alternative B

CO_2e (metric tons/year)									
GHG	2008	2009	2010	2011	2012	2013	2014	4 mtpy	End of Mine[1]
CH_4	722	802	858	1,123	762	919	1,117	2,444	7,499

[1] The end of the mine represents 2015 through 2019 methane emissions based on an aggregated tonnage of extracted coal (remaining 13.0 million remaining tons).

Direct Black Carbon Emissions

All haul truck types under Alternative B were evaluated for their contribution of black carbon as a percentage of overall particulate (**Table 4.3-20**).

Table 4.3-20 Black Carbon Emissions (tpy) from Haul Trucks, Alternative B

Haul Truck[1]	Black Carbon $PM_{2.5}$							
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
50 Ton	0.045	0.039	0.029	0.021	0.021	0.017	0.016	0.020
170 Ton	0.005	0.005	0.003	0.003	0.000	0.000	0.000	0.000
240 Ton[2,3]	0.016	0.014	0.010	0.007	0.016	0.013	0.026	0.016
Access Road[4]	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04
Haul Truck[1]	**Black Carbon PM_{10}**							
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
50 Ton	0.053	0.046	0.034	0.025	0.025	0.020	0.018	0.023
170 Ton	0.006	0.006	0.004	0.003	0.000	0.000	0.000	0.000
240 Ton[2,3]	0.017	0.015	0.011	0.008	0.018	0.015	0.029	0.017
Access Road[4]	4.10E-04	4.10E-04	4.10E-04	4.10E-04	4.10E-04	4.10E-04	4.10E-04	4.10E-04

1 Based on the length of the road, a percentage of the total vehicle miles traveled (VMT) are allocated to the paved road and in-pit road, respectively, speed of 25 mph.
2 Is assumed to only be spoil material through 2010 until the 170T trucks were removed. Assumed speed of 25 mph.
3 Starting in 2011 240T trucks hauled both spoil material and coal. A percentage of the total VMT are allocated to the paved and in-pit roads.
4 59/41% Ratio between cars and trucks; Model year 2000 cars/trucks assumed.

4.3.2.2 Potential Impacts

Potential Emissions Impacts – Based on Maximum Mining Rate of 4 mtpy

An annual mining rate of 4 mtpy is representative of maximum foreseeable production through the completion of active mining under Alternative B. GHG emissions are derived from all mobile sources associated with Alternative B (**Table 4.3-21**). This includes in-pit, hauling, rail maintenance, and access road components. Criteria pollutants and HAP calculations (**Table 4.3-22**) include all fugitive sources, process emissions, combustion activities and railroad maintenance under Alternative B.

Table 4.3-21 Alternative B GHG Emissions, 4 mtpy

Activity	CO_2 (mtpy)	CH_4 (mtpy)	N_2O (mtpy)	CO2e (mtpy)
Scrapers	2,504	0.14	0.07	2,528
Drills	1,315	0.05	0.01	1,320
Dozers	39,491	2.21	1.08	39,867
Graders	22,229	1.24	0.61	22,441
Haul Truck (240T)	18,927	4.74E-03	4.77E-03	18,928
Water Trucks	9,659	0.01	0.01	9,662
Blasting	56,071	1.98	0.53	56,278
Haul Coal to Crusher (50T)	7,927	0.01	0.01	7,930
Access Road	55	3.23E-03	0.01	57
Rail Maintenance	364	0.53	1.32	771
Total	158,542	6.18	3.64	159,782

Table 4.3-22 Alternative B Direct Criteria Emissions, 4 mtpy

Mining Rate	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NOx (tpy)	CO (tpy)	VOC (tpy)	SO_2 (tpy)	HAPs (tpy)
4 mtpy	1,528	179	1,257	7,461	48	0.9	6.1

Similar to Alternative A (6 mtpy) and actual emissions from 2007 to 2014, the direct emissions impact for a maximum mining rate into the future of 4 mtpy would be insignificant when compared to both state and national criteria, GHG, and HAP totals. HAPs associated with a 4 mtpy scenario would contribute 7.1 percent, 0.003 percent, and 0.00007 percent of surrounding counties, Colorado and national totals, respectively. Gaseous pollutants would range from 0.01 percent to 13.0 percent of county totals, 0.00001 percent to 0.01 percent of the national totals and 0.002 percent to 0.53 percent statewide. The 4 mtpy would contribute 0.12 percent of statewide GHGs and 0.007 percent nationwide.

Dispersion Modeling Impact Analysis

The 2014 operating year was modeled to ensure NAAQS compliance for the remaining years of active mining within the Project Area. Eleven scenarios of equipment allocation were analyzed and modeled, each as hypothetical real-life situations that could occur on any given day. Daily and annual activity rates were derived from the number of trucks, dozers, scrapers, etc. that the mine currently has onsite, initially based on a 4 mtpy mine plan. The following section describes the methodology used in preparing model inputs and assumptions made within the model itself.

Modeling Inputs

AERMOD utilizes several input parameters to simulate emissions and their corresponding dispersion characteristics. Colowyo collects meteorological data from an onsite meteorological station located at the following NAD 83 coordinates: 40°16'22.8" N, 107°48'36" W, elevation 7395 ft. These data were used as input following validation by CDPHE modeling personnel. Data beginning in July 2008 to June 2011 and July 2012 to June 2013 were accepted by CDPHE and used in the analysis. A windrose of the data collected from July 1, 2008 through June 31, 2013 is presented as **Figure 4-1**. A year-to-year data comparison showed consistency in the average wind speeds and directions and indicated that meteorological data was consistently collected. Wind directions had a strong tendency toward west/southwest directionality. Speeds varied somewhat; however, they tended to be strongest from the southwest and west.

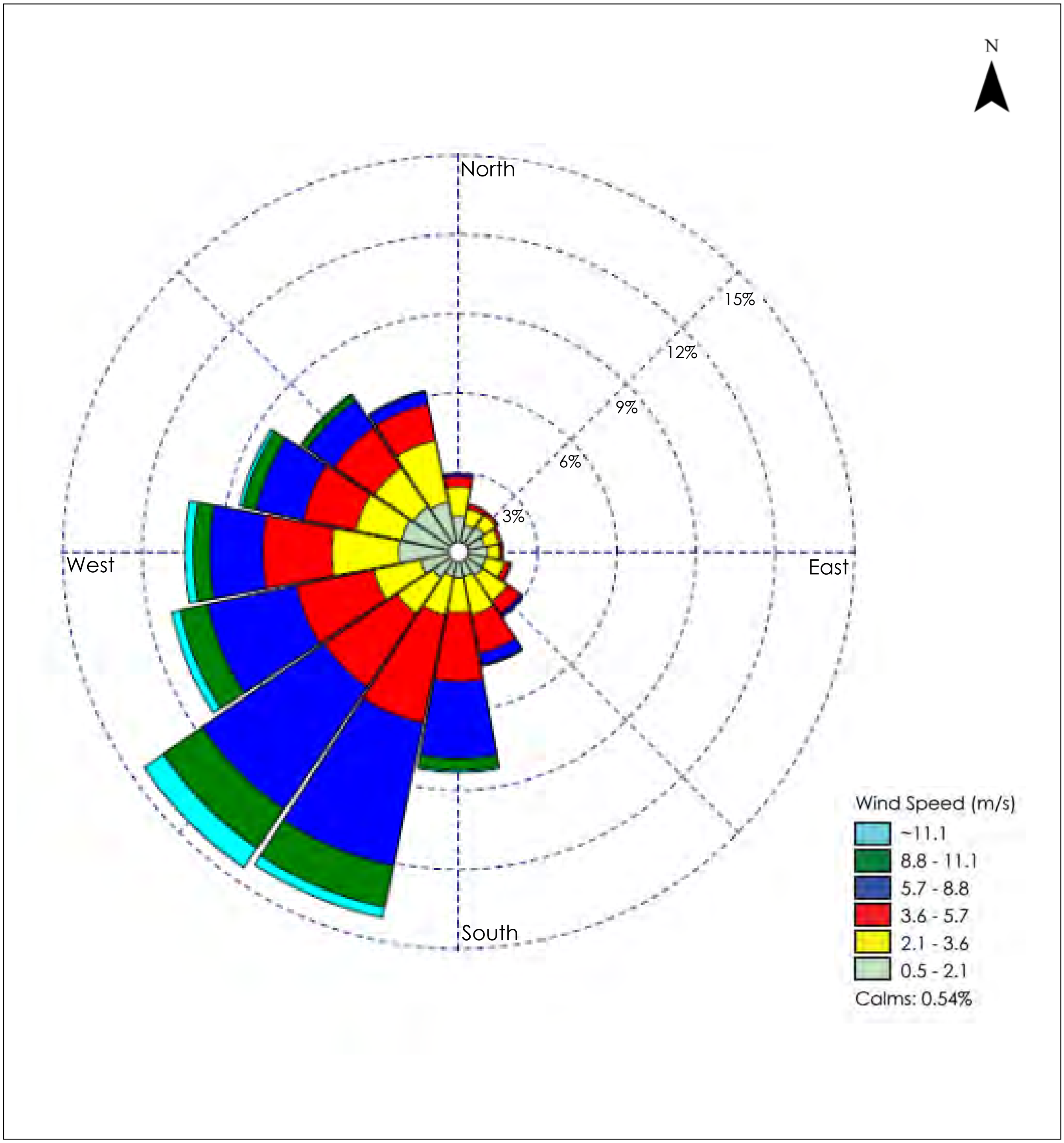
Two beta options are available in AERMOD to address concerns regarding model performance under low wind speed conditions. One of these options, the low wind speed option 2 (LOWWIND2), was employed for the modeling analyses. This option has been shown to enhance model accuracy during periods of low wind speeds and was selected to ensure the most accurate model outputs. The LOWWIND2 option increases the minimum value of sigma-v from 0.2 to 0.3 m/s, and incorporates the meander component, with some adjustments to the algorithm, including an upper limit on the meander factor (FRAN) of 0.95. Default values of sigma-v of 0.3 m/s and upper limit meander factor of 0.95 were utilized in the analyses.

Modeled Pollutants and Assumptions

Dispersion modeling was conducted to estimate the potential future air quality impacts from the following criteria air pollutants for the indicated regulatory time periods. All modeled concentrations are applicable at any point of public access.

- PM_{10} – 24 hour
- $PM_{2.5}$ – 24 hour and Annual
- NO_2 – 1 hour and Annual
- SO_2 – 1 hour
- CO – 1 hour and 8 hour

Compliance with the NAAQS was demonstrated by averaging the hourly and the annual modeled values for each pollutant, as specified in 40 CFR Part 51 Appendix W. *The EPA is currently proposing an update to the guidance outlined in Appendix W.* The pollutants were modeled without background concentrations. The modeled concentrations for each pollutant were added to background concentrations for comparison to the NAAQS. Modeling was not performed for lead because the lead emissions from the Project are expected to be negligible.



Data Period:
Start Date: 7/1/2008 - 00:00
End Date: 6/30/2013 23:00

Calm Winds:
0.54%

Average Wind Speed:
4.54 meters/second

Total Count:
34763 hours

Date:
2/2/2015

Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
4-1

Title
Modeled Period Windrose

Background Concentrations

To evaluate the potential impacts of emissions from the Project, the dispersion modeling evaluation considered the existing background concentrations of pollutants in the area where impacts are being evaluated. The background concentration of a given pollutant is added to the modeled impact, and the result is compared to the EPA's NAAQs. The NAAQS are allowable concentration limits applied at the public access boundary.

The CDPHE (Nancy Chick, CDPHE via letter) provided background concentrations that could be used for permitting at the mine. These background values were selected for use in this analysis (**Table 4.3-23**).

Table 4.3-23 Background Concentration Values

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)
$PM_{2.5}$	24-hr	14
	Annual	3
PM_{10}	24-hr	23
SO_2	1-hr	3
NO_2	1-hr	20
	Annual	2
CO	1-hr	1,145
	8-hr	1,145

Source Types

The Colowyo Mine consists of several types of emission sources. In general these include: point sources, surface area sources, volume sources (comprise all road sources, blasting, and railcar emissions), open pit sources (in-pit mining activities) and tailpipe emissions. **Figure 4-2** provides a general geographic representation of all modeled sources within the Project Area and relative distance to the outermost level of receptors (purple square on inset). Model receptors were placed throughout the region from the orange boundary to the purple square. Additionally, receptors were placed along County Road 51 within the Project Area.

Modeled Operating Scenarios

South Taylor coal extraction is maximized during 2014 operations at 4 mtpy. Mining operations are expected to continue through 2019. All subsequent years (2015-2019) are expected to have less than 4 mtpy of coal extracted. Therefore, all modeled 2014 operating scenarios represent the worst case potential emissions related to direct mining activities for the duration of the Project.

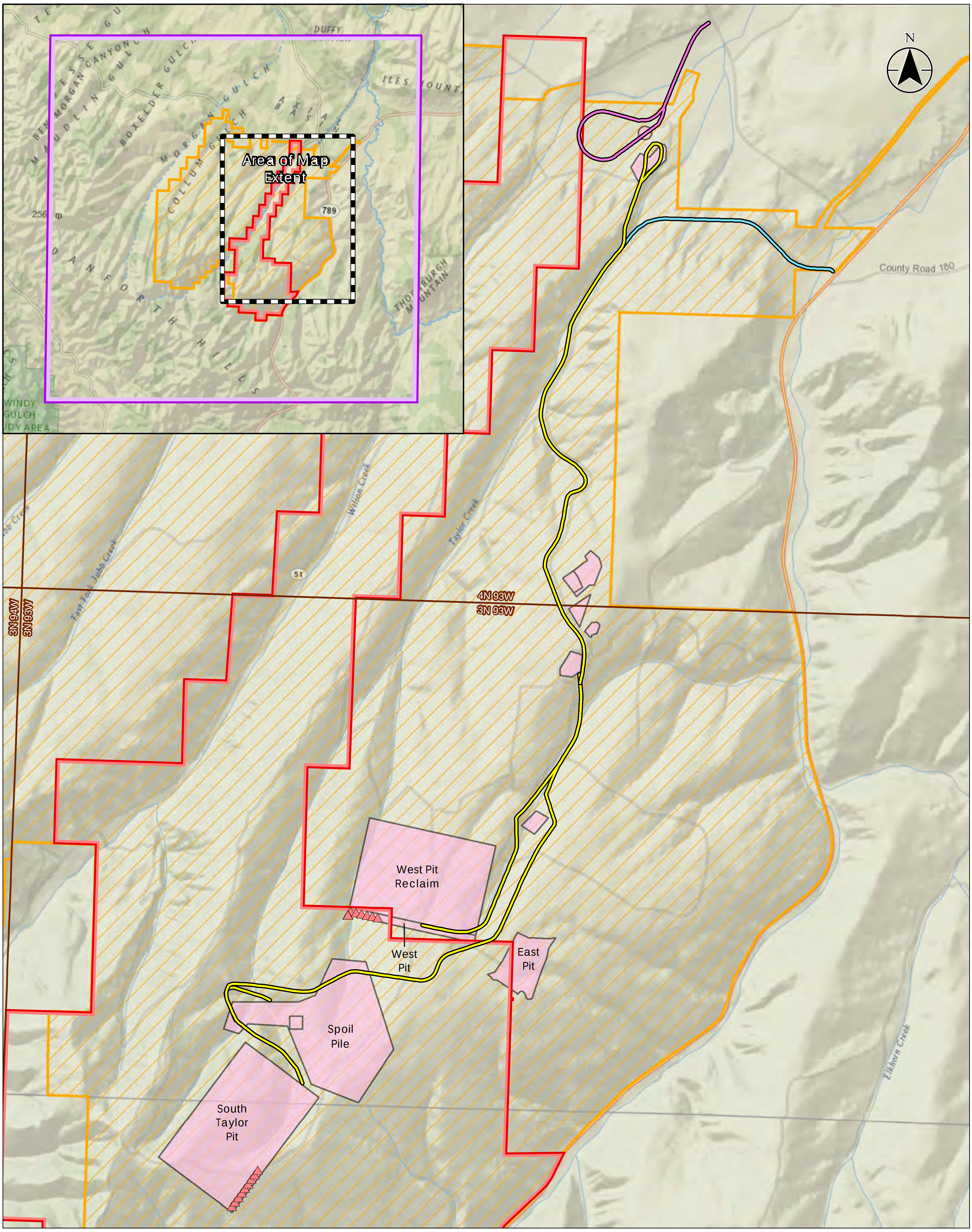
In order to account for operational uncertainty, multiple operational scenarios were modeled for 2014. These scenarios correspond with differing proposed onsite activities in various geographic regions, such as reclamation activities in one area versus another or differing equipment utilization. Each operations scenario was developed cooperatively with Colowyo staff and is based on fleet limitation and operational goals. Eleven operational scenarios were applied.

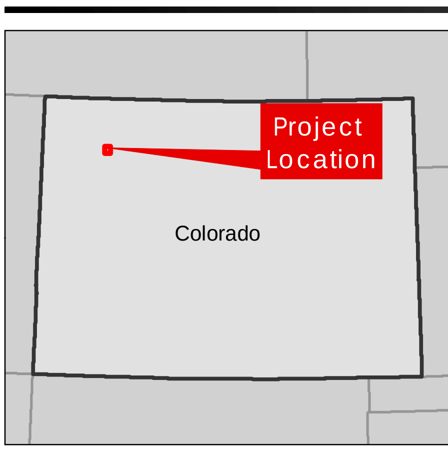
The dispersion modeling of all scenarios indicates that the emissions under Alternative B would not exceed the NAAQS for the pollutants modeled. This suggests that Alternative B at the proposed future maximum mining rate would not cause a significant impact to the NAAQS. **Table 4.3-24** illustrates that all potential operational scenarios would be compliant with all NAAQS when implementing the maximum foreseeable mining rate of 4 mtpy. The 24-hr $PM_{2.5}$ is the closet standard to being exceeded at 94.6 percent.

Table 4.3-24 Minimum & Maximum Impacts 2014 Ambient Analysis

Pollutant	Averaging Period	Background Concentration (µg/m³)	Minimum Model Results (µg/m³)	Maximum Model Results (µg/m³)	Total Range (µg/m³)[6]	NAAQS (µg/m³)	Percent of Standard Range
$PM_{2.5}$[1]	24-hr	14	13	19	27-33	35	78.2-94.6%
	Annual	3	4	7	7-10	12	57.6-80.7%
PM_{10}[2]	24-hr	23	48	103	71-126	150	47.3-83.8%
SO_2[3]	1-hr	3	0.98	1.13	4	196	2.03-2.22%
NO_2[1,5]	1-hr	20	147.94	147.96	168	188	89.3-89.4%
	Annual	2	5.8	6.0	7.8-8.0	100	7.8-8.0%
CO[4]	1-hr	1,145	16,475	18,358	17,620-19,503	40,000	44.1-48.8%
	8-hr	1,145	3,812	4,297	4,957-5,442	10,000	49.6-54.4%

[1] 8th high value
[2] 5th high over 4 years, deposition applied
[3] 4th high value
[4] 2nd high value, standard not to be exceeded more than once per year
[5] Use of OLM
[6] Total Range represents the summation of background concentrations and modeling results





Sources

- Blasting
- Access Road
- Haul Road
- Rail Loop
- Polygon Sources
- Project Area
- Approved SMCRA Permit Area
- Receptor Boundary
- Township Boundary

0 | 3,200 | 6,400 Feet

1:38,400 (At Original document size of 11x17)

Notes
1: Coordinate System: NAD 1983 UTM Zone 13N
2: Service Layer Credits: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.
4-2

Title
Geographic Location of Modeled Sources

4.3.2.3 Indirect Combustion Criteria Impacts

As described for Alternative A, emissions for criteria pollutants have been calculated for the combustion of mined coal. For Alternative B, emissions were calculated for the actual coal mining rate (assuming all coal mined was combusted) from 2007 through 2014 (the previous impacts) as well as the maximum proposed future mining rate and the current coal contract rate for the Craig Generating Station (potential impacts). As with Alternative A, the emissions were calculated using the regional maximum emission factor, the average regional emissions factor, and the Craig Generating Station emission factor. The resultant emissions are presented in **Table 4.3-25**.

Table 4.3-25 Predicted Criteria Emissions, Alternative B

Emissions Method	Coal Combustion Rate (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	NO_2 (tpy)	SO_2 (tpy)	VOC (tpy)
Regional Maximum							
2007	37,478	3.17	1.44	11.35	138.65	49.84	1.05
2008	1,181,227	99.93	45.51	357.75	4369.87	1570.86	33.16
2009	1,313,287	111.10	50.59	397.74	4858.41	1746.48	36.87
2010	1,404,226	118.79	54.10	425.29	5194.84	1867.42	39.42
2011	1,837,196	155.42	70.78	556.41	6796.57	2443.21	51.57
2012	1,247,203	105.51	48.05	377.73	4613.94	1658.60	35.01
2013	1,503,249	127.17	57.91	455.28	5561.16	1999.11	42.20
2014	1,828,253	154.67	70.43	553.71	6763.49	2431.31	51.32
Maximum Mining	4,000,000	338.39	154.10	1211.44	14797.71	5319.43	112.29
Contract Rate	2,300,000	194.57	88.61	696.58	8508.69	3058.67	64.57
Regional Average							
2007	37,478	2.38	1.28	9.79	124.99	39.93	0.81
2008	1,181,227	74.95	40.32	308.65	3939.28	1258.59	25.60
2009	1,313,287	83.33	44.83	343.16	4379.69	1399.30	28.47
2010	1,404,226	89.10	47.93	366.92	4682.96	1496.19	30.44
2011	1,837,196	116.57	62.71	480.05	6126.88	1957.52	39.82
2012	1,247,203	79.14	42.57	325.89	4159.31	1328.88	27.03
2013	1,503,249	95.39	51.31	392.79	5013.19	1601.70	32.58
2014	1,828,253	116.01	62.41	477.72	6097.05	1947.99	39.63
Maximum Mining	4,000,000	253.81	136.54	1045.18	13339.63	4261.97	86.70
Contract Rate	2,300,000	145.94	78.51	600.98	7670.28	2450.63	49.85
Craig Only							
2007	37,478	1.59	1.11	11.35	111.32	30.02	0.57
2008	1,181,227	49.98	35.13	357.75	3508.70	946.31	18.05
2009	1,313,287	55.56	39.06	397.74	3900.97	1052.11	20.06
2010	1,404,226	59.41	41.77	425.29	4171.09	1124.96	21.45

Emissions Method	Coal Combustion Rate (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	NO_2 (tpy)	SO_2 (tpy)	VOC (tpy)
2011	1,837,196	77.73	54.65	556.41	5457.18	1471.83	28.07
2012	1,247,203	52.77	37.10	377.73	3704.67	999.17	19.05
2013	1,503,249	63.60	44.71	455.28	4465.23	1204.29	22.97
2014	1,828,253	77.35	54.38	553.71	5430.61	1464.66	27.93
Maximum Mining	4,000,000	169.23	118.98	1211.44	11881.54	3204.51	61.11
Contract Rate	2,300,000	97.31	68.41	696.58	6831.88	1842.59	35.14

The Hayden Generating Station emission rates would produce the highest PM_{10}, $PM_{2.5}$, SO_2, VOC, and NOx emission rates of the two facilities while the Craig Generating Station would have the highest emission rate for CO.

Emissions at the maximum Alternative B annual mining rate would range from 0.01 percent to 5.75 percent of the total Colorado NEI emissions based on the Craig Generation Station only emission rate and would range from 0.02 percent to 9.55 percent of the total Colorado NEI emissions based on regional maximum emissions factor calculations (**Table 4.3-26**). It should be noted that these calculations *over predict the amount of emissions that would reasonably occur* as they would exceed the annual contracted coal delivery rate of 2.3 mtpy.

Emissions based on the actual mining rate from 2007 through 2014 ranged from 0.0 percent to 2.64 percent of the Colorado NEI total based on the Craig Generating Station only emission rates and ranged from 0.0 percent to 4.38 percent of the Colorado NEI total based on the regional maximum emissions calculations (**Table 4.3-26**).

As compared to the national NEI emissions totals, the 2007 to 2014 emissions rates represented between 0.00001 percent and 0.044 percent based on the worst case regional emission and between 0.00001 percent and 0.035 percent based on the Craig Generating Station emissions. For the maximum mining rate these percentages would rise to between 0.00029 percent and 0.014 percent for the regional maximum emissions and between 0.00019 and 0.095 percent for the Craig emissions factors.

Emissions at the 4 mtpy mining rate when compared to the four surrounding counties would range from 0.1 percent to 78.8 percent. There would be significant contributions associated with the two generating stations, but the regional designation regarding NAAQS compliance would not change and would remain in attainment. As described in **Section 4.3.2.4**, the state monitoring network has shown compliance with the NAAQS when natural exceptional events are excluded.

In general the maximum mining rate emissions impacts for Alternative B would be approximately 30 percent lower than those for Alternative A. The emissions impacts would represent insignificant impacts relative to the national emissions totals and moderate emissions impacts relative to the Colorado emissions total. However, these emissions impacts would not be greater than the current emissions from the Craig Generating Station.

Table 4.3-26 Predicted Criteria Emissions Compared to NEI, Alternative B

Emissions Method	Coal Combustion Rate (tpy)	PM_{10} (% of CO State 2011 NEI)	$PM_{2.5}$ (% of CO State 2011 NEI)	CO (% of 2011 CO State NEI)	NO_2 (% of CO State 2011 NEI)	SO_2 (% of CO State 2011 NEI)	VOC (% of CO State 2011 NEI)
Regional Maximum							
2007	37,478	0.00	0.00	0.00	0.05	0.09	0.00
2008	1,181,227	0.03	0.04	0.03	1.44	2.82	0.01
2009	1,313,287	0.03	0.05	0.03	1.60	3.13	0.01
2010	1,404,226	0.04	0.05	0.03	1.71	3.35	0.01
2011	1,837,196	0.05	0.07	0.04	2.23	4.38	0.01
2012	1,247,203	0.03	0.05	0.03	1.52	2.98	0.01
2013	1,503,249	0.04	0.06	0.03	1.83	3.59	0.01
2014	1,828,253	0.05	0.07	0.04	2.22	4.36	0.01
Max Mining	4,000,000	0.10	0.15	0.09	4.86	9.55	0.02
Contract Rate	2,300,000	0.06	0.09	0.05	2.80	5.49	0.01
Regional Average							
2007	37,478	0.00	0.00	0.04	0.07	0.00	0.00
2008	1,181,227	0.02	0.04	0.02	1.30	2.26	0.00
2009	1,313,287	0.03	0.04	0.02	1.44	2.51	0.01
2010	1,404,226	0.03	0.05	0.03	1.54	2.69	0.01
2011	1,837,196	0.04	0.06	0.03	2.01	3.51	0.01
2012	1,247,203	0.02	0.04	0.02	1.37	2.39	0.00
2013	1,503,249	0.03	0.05	0.03	1.65	2.87	0.01
2014	1,828,253	0.04	0.06	0.03	2.00	3.50	0.01
Maximum Mining	4,000,000	0.08	0.13	0.07	4.39	7.65	0.02
Contract Rate	2,300,000	0.04	0.08	0.04	2.52	4.40	0.01
Craig Only							
2007	37,478	0.00	0.00	0.04	0.05	0.00	0.00
2008	1,181,227	0.02	0.03	0.03	1.15	1.70	0.00
2009	1,313,287	0.02	0.04	0.03	1.28	1.89	0.00
2010	1,404,226	0.02	0.04	0.03	1.37	2.02	0.00
2011	1,837,196	0.02	0.05	0.04	1.79	2.64	0.01
2012	1,247,203	0.02	0.04	0.03	1.22	1.79	0.00
2013	1,503,249	0.02	0.04	0.03	1.47	2.16	0.00
2014	1,828,253	0.02	0.05	0.04	1.79	2.63	0.01
Maximum Mining	4,000,000	0.05	0.12	0.09	3.91	5.75	0.01
Contract Rate	2,300,000	0.03	0.07	0.05	2.25	3.31	0.01

Indirect Coal Combustion GHG and Climate Change Impacts

Similar to Alternative A, GHG emissions were calculated for the coal combustion associated with Alternative B (**Table 4.3-27**).

Table 4.3-27 GHG Coal Combustion Emissions, Alternative B

Coal Combusted (Short Tons)		CO_2 Emissions (metric tonnes)	CH_4 Emissions (metric tonnes)	Total CH_4 in CO2e (metric tonnes)	N_2O Emissions (metric tonnes)	Total N_2O in CO2e (metric tonnes)	Total CO_2e (metric tonnes)
37,478	2007 Actual ST Mine Rate	87,154	10	257	1	445	87,856
1,181,227	2008 Actual ST Mine Rate	2,746,908	324	8,098	47	14,041	2,769,047
1,313,287	2009 Actual ST Mine Rate	3,054,010	360	9,004	52	15,611	3,078,624
1,404,226	2010 Actual ST Mine Rate	3,265,487	385	9,627	56	16,692	3,291,805
1,837,195	2011 Actual ST Mine Rate	4,272,344	504	12,595	73	21,838	4,306,778
1,247,203	2012 Actual ST Mine Rate	2,900,334	342	8,551	50	14,825	2,923,710
1,503,248	2013 Actual ST Mine Rate	3,495,760	412	10,306	60	17,869	3,523,935
1,828,253	2014 Actual ST Mine Rate	4,251,548	501	12,534	73	21,732	4,285,814
2,300,000	Current Craig Contract Annual Maximum	5,348,582	631	15,768	92	27,339	5,391,689
4,000,000	Proposed Mine Rate Maximum	9,301,882	1,097	27,423	160	47,546	9,376,851
23,314,641	Proposed Total Mine Tonnage	54,217,508	6,394	159,839	930	277,132	54,654,479

The values detailed in the table represent the calculated GHG emissions that occurred for the actual coal mining rates from 2007 to 2014. Emissions data has also been calculated for the combustion at the proposed annual maximum mining rate, the current mining rate for the Craig Generating Station, and total GHG emissions from the combustion of all coal to be mined under Alternative B through 2019. During the period from 2007 to 2014, actual coal mined in the Project Area generated emissions that annually accounted for between 0.0003 percent and 0.015 percent of estimated global emissions and between 0.001 percent and 0.071 percent of estimated U.S. net emissions (previous impact).

The future GHG emissions (potential impact) under Alternative B would account for between 0.019 percent and 0.032 percent of estimated annual global emissions and between 0.089 percent and 0.15 percent of estimated annual U.S. net emissions. Both the previous and potential impacts under Alternative B would be negligible and are less than those under Alternative A.

Social Cost of Carbon

Due to the reduction in maximum future mining rate from 6 mtpy (Alternative A) to 4 mtpy (Alternative B), annual CO_2 equivalent emissions would be reduced from 14,065,277 to 9,376,851 mtpy (assuming all mined coal is burned in one year). As previously noted, specific threshold levels for the determination of significance or benefit can vary depending on numerous project factors. NEPA does not require a cost-benefit analysis. Presenting the SCC cost estimates quantitatively, without a complete monetary cost-benefit analysis that includes the social benefits of energy production, would be misleading. For this reason the SCC protocol was not applied for this assessment. GHG coal combustion emissions are quantified and contextualized against global and national GHG emissions above.

Ozone Precursor Emissions Impacts

Based on *maximum onsite blasting and* the combustion at the Craig Generating Station at either the Alternative B maximum rate as well as at the reasonably foreseeable contracted rate, conservative estimates of O_3 precursors are included in **Table 4.3-28**. The emissions were calculated in a fashion consistent with the method described for Alternative A.

Table 4.3-28 Predicted Ozone Precursor Emissions Rates, Alternative B

Emissions Method	Coal Combustion Rate (tpy)	NO_X (tpy)	VOC (tpy)
Craig Generating Station Only	4,000,000	*11,882*	61.11
Craig Generating Station Only	2,300,000	*6,832*	35.14
Onsite Blasting	*Not applicable*	*882*	*0.16*

Although these values represent large amounts of O_3 precursors, emissions from the Craig Generating Station, as well as all other regional sources of precursor emissions, have not produced significant O_3 impacts as indicated by regional O_3 monitoring and the region's attainment with the O_3 NAAQS. A detailed description of the monitoring data for all criteria pollutants from 2007 through present is described in the following sections. The O_3 component of these descriptions demonstrates that O_3 impacts would not exceed the NAAQS and would therefore not be considered significant.

Indirect Mercury Emissions

During the period from 2007 to present, the Craig Generating Station has provided actual mercury emissions from all onsite atmospheric emission sources via the USEPA's TRI program. Mercury emission for the Craig Generating Station from 2007 to 2013 was reported by the facility for all atmospheric emissions sources (**Table 4.3-29**).

Table 4.3-29 TRI Reported Atmospheric Mercury Emissions for the Craig Generating Station

Reporting Year	Hg Emissions	Units
2007 TRI	130	lb/year
2008 TRI	130	lb/year
2009 TRI	30	lb/year
2010 TRI	43	lb/year
2011 TRI	43	lb/year
2012 TRI	44	lb/year
2013 TRI	42.4	lb/year

Based on the reported TRI emissions and the coal consumed at the Craig Generating Station reported during that period, an emissions factor can be calculated for a pound of mercury per ton of coal combusted. Based on the calculated emissions factors derived from the TRI, mercury emission impacts can vary significantly between the 2007 emissions controls in place at the Craig Generating Station and the 2013 emissions controls in place. The resultant mercury emissions impacts are detailed in **Table 4.3-30**.

Table 4.3-30 Potential Coal Combustion Mercury Emissions Using Craig Generating Station TRI Actual Emissions

Coal Production	Emission Factor (Derived from 2007 TRI)	Emission Factor (Derived from 2013 TRI)	Total Predicted Hg Emissions (Derived from 2007 TRI)	Total Predicted Hg Emissions (Derived from 2013 TRI)
23.3 mt (Project Total)	2.58292E-05 (lb/ton combusted)	9.20858E-06 (lbs/ton combusted)	602.20 (lbs Hg)	214.70 (lbs Hg)
4 mtpy (Maximum Annual Production)	2.58292E-05 (lbs/ton combusted)	9.20858E-06 (lbs/ton combusted)	103.32 (lbs Hg/year)	36 (lbs Hg/year)

Using annual mine rates and the annual emission rates calculated from the TRI mercury emissions data, the contribution of emissions from Alternative B were calculated (**Table 4.3-31**).

Table 4.3-31 Approximate Mercury Emissions from the Craig Generating Station Based on TRI Actual Emissions, Alternative B

Combustion Year	Emissions	Units
2007	1.0	lbs Hg/Year
2008	30.5	lbs Hg/Year
2009	8.4	lbs Hg/Year
2010	12.3	lbs Hg/Year
2011	17.1	lbs Hg/Year
2012	11.8	lbs Hg/Year
2013	15.5	lbs Hg/Year
Total	**96.8**	**lbs Hg**

As can be seen by comparing **Table 4.3-29 and Table 4.3-31**, mercury emissions from 2007 to 2013 were significantly below those that would occur at the maximum mining rate.

If all mercury emissions from the combustion of coal are calculated using the Craig Generating Station 2013 TRI emissions factor, the total mercury emissions that would be generated by burning the 23.3 million tons of coal mined under Alternative B would result in 214.69 lbs of mercury. This value is approximately 40 percent lower mercury emissions than those estimated by the same calculation for the coal mined under Alternative A.

Additionally, based on data available from the TRI data explorer, the electrical generation sector in Colorado generated approximately 1,070 lbs of mercury emissions for reporting year 2013. The contribution of Alternative B coal combustion emissions was approximately 1.5 percent of that total for 2013 based on actual mining rates and would only be 3.4 percent of the total mercury generated in Colorado under the Alternative B maximum mining rate (4 mtpy) if all of the coal was sent to the Craig Generating Station. When compared to the national mercury total of 25.6 tons, as reported in the 2011 NEI would be 0.09 percent. This represents a negligible to minor percentage of the total mercury generated both in Colorado and nationally.

4.3.2.4 Regional NAAQS Compliance

The following section outlines regional monitoring data from 2007 through 2013 *associated with CDPHE. Unlike the onsite Colowyo monitors, those associated with CDPHE are federal reference method (FRM) monitors rather than FEM. The EPA has defined FRMs for the measurement of various criteria pollutants, such as carbon CO, O_3, NO_2, PM_{10}, and $PM_{2.5}$. These methods are described in detail in 40 CFR §50.1. For both PM_{10} and $PM_{2.5}$, the FRM is based upon manual sampling techniques where a pre-weighed filter is installed into a sampling device, ambient air is sampled for 24 hours, and then the filter is retrieved, equilibrated and reweighed in order to determine the concentration of particulate on the filter. Only the measurement techniques defined in 40CFR §50.1 can be FRMs. The EPA also allows the use of FEMs for air quality surveillance.*

One requirement for FEM monitors is that they meet all EPA data quality objectives (DQO). DQOs are developed by the EPA to support primary objectives for each criteria pollutant and are statements that *define the appropriate type of data that should be collected. They also specify the tolerable levels of potential errors that are used as a basis for establishing the quality and quantity of data. FEM monitors must also meet appropriate EPA requirements regarding measurement standards. Each pollutant has a specific uncertainty measurement. For example, O_3 requires an upper 90 percent confidence limit for the coefficient of variation (CV) of 15 percent and a bias of 95 percent confidence limit for the absolute bias of 15 percent.*

Both the North monitor and Gossard monitor are FEM monitors but are not operated as FEM monitors due to the fact that they do not meet all EPA-defined DQO. As a result, the data from the monitors may not be used for attainment/nonattainment area determination, and as such, the data from the North and Gossard monitors submitted to CDPHE is not included in the EPA's national database of ambient air quality monitoring data.

The monitored data discussed below are FRMs operated by CDPHE geared toward evaluating NAAQS compliance. Particulate matter, CO, and O_3 data is shown and discussed in a regional NAAQS compliance context.

Regional NAAQS Compliance

The regional monitoring network utilized by CDPHE is described in **Section 4.3.1.4** *under Regional O_3 NAAQS compliance*. While the network is consistent between Alternatives A and B, analysis for Alternative B examines the progression from year to year beginning in 2007 and ending in 2013.

2007 Compliance

Grand Junction is the only large city in the area and the only location that monitors for CO on the Western Slope. The other Western Slope monitors are located in the cities of Parachute, Rifle, Silt, Glenwood Springs, Delta, Durango, and Telluride.

Table 37 of the CDPHE 2007 Air Quality Annual Report[7] identifies the particulate annual average and 24-hr maximum concentrations at each monitor. The $PM_{2.5}$ standards are 15 μg/m^3 (annual) and 35 μg/m^3 (24-hr), and the PM_{10} standard is 150 μg/m3. The $PM_{2.5}$ annual standard was lowered to 12 μg/m^3 on December 5, 2012. There are two 24-hr PM_{10} maximums that exceed the standard (New Castle 286 μg/m^3 and the Grand Junction continuous monitor at 181 μg/m^3). The New Castle event was considered exceptional by CDPHE as it was associated with a nearby mud slide cleanup effort. Also, the Grand Junction result occurred with less than 75 percent usable data for at least one quarter during the year. Table 38 of the annual report identifies the 1-hr and 8-hr CO maximums (2.9 ppm and 1.8 ppm, respectively) in Grand Junction. Both highs are well below the respective standards of 35 ppm and 9 ppm.

2008 Compliance

Three O_3 monitors were added to the Western Counties Monitoring Network in 2008 in Rifle, the Palisade Water Treatment facility, and in Cortez.

[7] CDPHE AQCD - 2007 Air Quality Data Report

The maximum PM_{10} concentration was captured by the Parachute monitoring station at 210 $\mu g/m^3$. However, one exceedance does not indicate a NAAQS violation. As discussed in **Section 4.3.2.1**, the PM_{10} standard is based on a three year average. In addition, Figure 37 of the 2008 Air Quality Annual Report indicated that the high concentrations seen at the Parachute site were due to construction in the vicinity of the monitor.

CO maximum was found to be less than the standard at 7.1 ppm and 2.6 ppm for 1-hr and 8-hr, respectively. It should be noted that the standard allows for the 2nd high value rather than the maximum for NAAQS compliance purposes.

O_3 standards are based on the 4th high value averaged over a three year period for the 8-hr averaging period (standard of 0.075 ppm). The 4th high value maximum between the three new monitors in 2008 was 0.070 ppm at the Palisade Water Treatment facility. While it is close to the standard, the concentration is not representative of a three year average value, and the monitor was installed on May 30, 2008. It does not represent a complete year of data.

2009 Compliance

The Monitoring Network remained unchanged for the region from 2008. Starting in 2009, CDPHE annual reports provided the calculated three year average number of exceedances for PM_{10} and the 98th percentile three year average for $PM_{2.5}$. If the three-year average number of exceedances is greater than 1 and the 98th percentile average is greater than the standard (35$\mu g/m^3$) that equates to a violation provided exceptional events are excluded. **Table 4.3-32** illustrates that neither is exceeded; indicating that the region maintained its attainment status for 2009.

CO monitored maximums did not exceed 2.3 ppm and 2.2 ppm. Both Palisade and Cortez showed a maximum O_3 4th high of 0.064 ppm.

2010 Compliance

The Monitoring Network remained unchanged for the region from 2009. The CDPHE as a whole saw 19 exceedances in 2010 on six separate days. Four of the towns within the Western Counties (Durango, Grand Junction, Clifton, and Telluride) were greatly impacted by large regional dust storms. In addition, several other high concentration days were documented as exceptional event by CDPHE[8,9] (**Table 4.3-33**).

[8] CDPHE AQCD - 2007 Air Quality Data Report
[9] CDPHE AQCD Division Exceptional Event Repository
http://www.colorado.gov/airquality/tech_doc_repository.aspx#exceptional_events

Table 4.3-32 2009 Western Counties Particulate Monitor Concentrations

Site Name	Location	PM_{10} (µg/m3)			$PM_{2.5}$ (µg/m^3)			
		Annual Avg.	24-hr Max	3-yr Avg Exceedances[1]	Annual Avg.	3-yr Weighted Avg.	24-hr Max	3-yr Avg 98th %ile[1]
Delta County								
Delta	560 Dodge St.	26.8	186	0.33	--	--	--	--
Garfield County								
Parachute	100 E. 2nd Ave	25.3	83	0.33	--	--	--	--
Rifle	144 E. 3rd Ave	24.5	83	0	--	--	--	--
La Plata County								
Durango	1235 Camino del Rio	23.2	203	0.66	--	--	--	--
Mesa County								
Grand Junction – Powell	650 South Ave	25.3	69	0	9.74	--	59	30.6
GJ Continuous - Pitkin	645 ¼ Pitkin Ave	24.5	65	--	6.12	--	148	--
Clifton	Hwy 141 & D Road	31.7	147	0	--	--	--	--
Montezuma County								
Cortez	106 W. North St.	--	--	--	6.75	<3-yr data	19	<3-yr data
San Miguel County								
Telluride	333 W. Colorado Ave	18.4	130	0	--	--	--	--

[1] Three year averaging period is representative of 2007-2009.
-- No applicable data available

Table 4.3-33 2010 Western Counties Particulate Monitor Concentrations

Site Name	Location	PM10 (µg/m³)			PM2.5 (µg/m³)			
		Annual Avg.	24-hr Max	3-yr Avg Exceedances[1]	Annual Avg.	3-yr Weighted Avg.	24-hr Max	3-yr Avg 98th %ile[1]
Delta County								
Delta	560 Dodge St.	23.4	125	0	--	--	--	--
Garfield County								
Parachute	100 E. 2nd Ave	22.5	125	0	--	--	--	--
Rifle	144 E. 3rd Ave	25.5	59	0	--	--	--	--
La Plata County								
Durango	1235 Camino del Rio	24.8	320	6.1	--	--	--	--
Mesa County								
Grand Junction – Powell	650 South Ave	22.9	155	0	9.3	--	--	34.5
GJ Continuous - Pitkin	645 ¼ Pitkin Ave	26.8	171	1	--	--	--	--
Clifton	Hwy 141 & D Road	23.0	189	3	--	--	--	--
Montezuma County								
Cortez	106 W. North St.	--	--	--	--	<3-yr data	--	<3-yr data
San Miguel County								
Telluride	333 W. Colorado Ave	19.9	354	3.1	--	--	--	--

[1] Three year averaging period is representative of 2008-2010.
-- No applicable data available

CO monitored maximums did not exceed 1.7 ppm and 1.2 ppm. Palisade showed a maximum O_3 4th high of 0.068 ppm and a three-year average 4th high of 0.067 ppm (**Table 4.3-34**).

Table 4.3-34 2010 Western Counties Ozone Monitor Concentrations

Site Name	Location	Ozone 8-hr Avg (ppm)		
		1st Maximum	4th Maximum	3-yr Avg of 4th Max. (2008-2010)
Garfield County				
Rifle	195 14th St.	0.069	0.066	0.064
Mesa County				
Palisade Water Treatment	865 Rapid Creek Dr.	0.070	0.068	0.067
Montezuma County				
Cortez	106 W. North St.	0.076	0.064	0.064

2011 Compliance

A fourth O_3 monitor was added in 2011 at Lay Peak in Moffat County. All particulate monitors remained operational from 2010.

Similar to 2010, there were regional dust storms in the Durango and Telluride areas. There are two exceptional reports from April 3, 2011 and December 1, 2011 that identify high wind events at the Alamosa and Lamar monitoring locations. While the reports do not explicitly discuss Durango and Telluride, it states that the prefrontal surface winds were out of a west to southwesterly direction and moved over dry soils in Arizona, northwest New Mexico, southeast Utah, and southern Colorado producing significant blowing dust. Behind the cold front the winds were northerly which moved over dry soils in eastern Colorado, consequently also producing significant amounts of blowing dust. This storm system transported PM_{10} dust into the southern and southeastern portions of Colorado. Secondly, both Durango and Telluride are more than 175 miles (*282 km*) south of Craig and the mine. It is unlikely that any exceedances from those two sites (**Table 4.3-35**) would adversely affect the ambient air surrounding the mine. Last, the EPA identifies Colorado State AQCR 11 (Garfield, Mesa, Moffat, and Rio Blanco counties) as attainment/unclassifiable for PM_{10} since 1990 (40 CFR 81.306).

Table 4.3-35 2011 Western Counties Particulate Monitor Concentrations

Site Name	**Location**	**PM_{10} (µg/m3)**			**$PM_{2.5}$ (µg/m3)**			
		Annual Avg.	**24-hr Max**	**3-yr Avg Exceedances[1]**	**Annual Avg.**	**3-yr Weighted Avg.[1]**	**24-hr Max**	**3-yr Avg 98th %ile[1]**
Delta County								
Delta	560 Dodge St.	21.4	51	0	--	--	--	--
Garfield County								
Parachute	100 E. 2nd Ave	21.3	96	0	--	--	--	--
Rifle	144 E. 3rd Ave	20.5	54	0	--	--	--	--
La Plata County								
Durango[2]	1235 Camino del Rio	18.1	51	1.3	--	--	--	--
Mesa County								
Grand Junction – Powell	650 South Ave	18.6	41	0	--	8.6	--	33.5
GJ Continuous - Pitkin	645 ¼ Pitkin Ave	23.0	90	0	--	--	--	--
Clifton	Hwy 141 & D Road	19.9	60	1	--	--	--	--

Site Name	Location	PM_{10} (µg/m3)			$PM_{2.5}$ (µg/m3)			
		Annual Avg.	24-hr Max	3-yr Avg Exceedances[1]	Annual Avg.	3-yr Weighted Avg.[1]	24-hr Max	3-yr Avg 98th %ile[1]
Montezuma County								
Cortez	106 W. North St.	--	--	--	--	6.3	--	14.4
San Miguel County								
Telluride[2]	333 W. Colorado Ave	16.4	68	3.1	--	--	--	--

[1] Three year averaging period is representative of 2009-2011.

[2] The 2010 exceptional events are included in the three year average exceedances.

-- No applicable data available

CO monitored maximums did not exceed 1.8 ppm and 1.1 ppm. Cortez showed a maximum O_3 4th high of 0.071 ppm and a three-year average 4th high of 0.066 ppm (**Table 4.3-36**).

Table 4.3-36 2011 Western Counties Ozone Monitor Concentrations

Site Name	Location	Ozone 8-hr Avg (ppm)		
		1st Maximum	4th Maximum	3-yr Avg of 4th Max. (2009-2011)
Garfield County				
Rifle	195 14th St.	0.068	0.066	0.064
Mesa County				
Palisade Water Treatment	865 Rapid Creek Dr.	0.069	0.066	0.066
Montezuma County				
Cortez	106 W. North St.	0.073	0.071	0.066
Moffat County				
Lay Peak	17820 CR 17	0.065	0.060	<3-yr data

2012 Compliance

In 2012, CDPHE modified their monitoring region boundaries. The region consists of complex terrain including a mix of mountains, plateaus, valleys, and canyons. Grand Junction remains the largest city in the region. The Durango-Cortez monitoring sites are no longer included in this report as both are now in the southwest region. Also, the Pitkin location in Grand Junction contains only a CO monitor. All other monitors remain in the Western Slope network.

The region had one maximum exceedance at the Powell station (**Table 4.3-37**), but the three-year average does not exceed 1; thus there is not a PM_{10} violation.

Table 4.3-37 2012 Western Slope Particulate Monitor Concentrations

Site Name	Location	PM_{10} (µg/m³)			$PM_{2.5}$ (µg/m³)			
		Annual Avg.	24-hr Max	3-yr Avg Exceedances[1]	Annual Avg.	3-yr Weighted Avg.[1]	24-hr Max	3-yr Avg 98th %ile[1]
Delta County								
Delta	560 Dodge St.	24.4	65	0	--	--	--	--
Garfield County								
Parachute	100 E. 2nd Ave	18.7	65	0	--	--	--	--
Rifle	144 E. 3rd Ave	19.5	50	0	--	--	--	--
Mesa County								
Grand Junction – Powell	650 South Ave	22.7	176	0.33	--	7.8	--	27.9
Clifton	Hwy 141 & D Road	19.5	74	0	--	--	--	--
San Miguel County								
Telluride	333 W. Colorado Ave	16.9	80	0	--	--	--	--

[1] Three-year averaging period is representative of 2010-2012. -- No applicable data available

CO monitored maximums do not exceed 2.0 ppm and 1.1 ppm. Palisade showed a maximum O_3 4th high of 0.072 ppm and a three-year average 4th high of 0.068 ppm (**Table 4.3-38**).

Table 4.3-38 2012 Western Counties Ozone Monitor Concentrations

Site Name	Location	Ozone 8-hr Avg (ppm)		
		1st Maximum	4th Maximum	3-yr Avg of 4th Max. (2010-2012)
Garfield County				
Rifle	195 14th St.	0.078	0.068	0.066
Mesa County				
Palisade Water Treatment	865 Rapid Creek Dr.	0.075	0.072	0.068
Moffat County				
Lay Peak	17820 CR 17	0.072	0.066	<3-yr data

2013 Compliance

The Western Slope monitors remained unchanged from 2012 and results were similar to the previous year (**Table 4.3-39**).

Table 4.3-39 2013 Western Slope Particulate Monitor Concentrations

Site Name	Location	PM_{10} (µg/m³)			$PM_{2.5}$ (µg/m³)			
		Annual Avg.	24-hr Max	3-yr Avg Exceedances[1]	Annual Avg.	3-yr Weighted Avg.[1]	24-hr Max	3-yr Avg 98th %ile[1]
Delta County								
Delta	560 Dodge St.	21.3	64	0	--	--	--	--
Garfield County								
Parachute	100 E. 2nd Ave	14.5	29	0	--	--	--	--
Rifle	144 E. 3rd Ave	17.5	46	0	--	--	--	--
Mesa County								
Grand Junction – Powell	650 South Ave	19.2	55	0.33	--	7.7	--	28.8
Clifton	Hwy 141 & D Road	17.6	109	0	--	--	--	--
San Miguel County								
Telluride	333 W. Colorado Ave	14.6	58	0	--	--	--	--

[1] Three year averaging period is representative of 2011-2013.
-- No applicable data available

CO monitored maximums do not exceed 1.5 ppm and 0.9 ppm. Palisade showed a maximum O_3 4th high of 0.066 ppm and a three-year average 4th high value of 0.067 ppm (**Table 4.3-40**).

Table 4.3-40 2013 Western Slope Ozone Monitor Concentrations

Site Name	Location	Ozone 8-hr Avg (ppm)		
		1st Maximum	4th Maximum	3-yr Avg of 4th Max. (2011-2013)
Garfield County				
Rifle	195 14th St.	0.065	0.062	0.065
Mesa County				
Palisade Water Treatment	865 Rapid Creek Dr.	0.068	0.066	0.067
Moffat County				
Lay Peak	17820 CR 17	0.067	0.065	<3-yr data

Since the mine began operations within the Project Area, there has not been a change in the regional attainment designation from the Western Slope counties for $PM_{2.5}$, PM_{10}, and CO. The exceedances that have occurred either at the mine or regionally were primarily due to natural phenomena outside the control of Colowyo or other facilities.

As discussed in **Section 4.3.1.4**, there are no O_3 exceedances regionally of the current 0.075 ppm standard. The combustion rate of the Craig and Hayden Generating Stations is not proposed to change in the foreseeable future; although the precursor emissions are high it does not equate to a regional O_3 compliance issue. The regional O_3 reaction is limited by VOC emissions; even large amounts of NOx emissions do not lead to higher O_3 concentrations. Although the emissions rates for NO_x are substantial from the coal combustion, if the regional O_3 reaction is limited by VOC emissions, even large amounts of NO_x emissions do not lead to higher O_3 concentrations.

4.3.2.5 Indirect Railroad Emissions

Railroad emissions associated with the Colowyo-owned rail spur were determined for a maximum shipping scenario of annual coal tonnage. The emissions are based on the maximum number of annual round trips made by the train. **Table 4.3-41** includes the quantity of coal shipped via rail from the mine from all active mining areas, including the Project Area, from 2007 to 2014.

Table 4.3-41 Actual Coal Shipped via Rail 2007-2014

Calendar Year	Quantity of Coal Shipped (tpy)
2007	5,603,387
2008	5,023,737
2009	3,490,157
2010	3,552,630
2011	2,362,725
2012	2,318,968
2013	2,170,905
2014	2,433,433

Table 4.3-42 outlines the maximum criteria pollutant emissions, GHG emissions, and HAP *estimated* emissions that result from rail transport and maintenance from the mine from 2007 to 2014.

Table 4.3-42 Railcar and Rail Maintenance Emission Estimates (tpy)

Source	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2	HAPs	GHG[1]	Black Carbon[2]
Railcar	0.1	0.1	6.3	8.1	0.3	0.03	1.5E-02	3,065	0.1
Rail Maintenance	0.1	0.1	0.5	0.5	0.1	0.1	1.5E-02	605	0
Total	0.2	0.2	6.8	8.6	0.4	0.1	0.03	3,670	0.1

[1] Greenhouse gas emissions are presented as CO_2e metric tonnes per year.
[2] Black carbon is a component of particulate. Therefore, total PM_{10} and $PM_{2.5}$ would equate to 0.3 tons/yr, respectively with black carbon included.

Rail emissions were also calculated for combustion rates of 2.3 and 5.0 mtpy to account for potential future emissions. Criteria pollutant emissions for the lower bound (2.3 mtpy) range from 0.1 to 3.30 tons/yr. The range of emissions for the upper bound (5 mtpy) is 0.3-7.2 tons/yr. Rail maintenance emissions will remain unchanged. Therefore, the maximum emissions will be CO at 7.7 tons/yr.

All criteria pollutants and HAP emissions associated with railcar activities were compared to the county data from the 2011 NEI. Alternative B would contribute a maximum of 0.0139 percent of all criteria pollutants and 0.0405 percent of all HAPs emitted within Garfield, Moffatt, Rio Blanco, and Routt counties. In comparison, the direct emissions from Alternative B would be insignificant.

Railroad emissions are far less than many other emissions-generating activities previously described. As a result all emissions would be insignificant when compared to statewide totals. Colorado emitted 195,455 tons of HAPs in 2001; therefore, the percentage associated with the railcars would be 0.000008 percent.

4.3.3 No Action Alternative

4.3.3.1 Direct Emissions Impacts

The No Action Alternative assumes that mining would cease immediately if the Project was not approved. An insignificant amount of criteria emissions associated with closure and reclamation activities would continue to occur until reclamation is complete

4.3.3.2 Indirect Combustion Criteria Emissions Impacts

Under the No Action Alternative, criteria pollutant emissions from coal combustion at the Craig Generating Station would remain consistent with the current emissions rates. The mine would no longer provide coal to the Craig Generating Station; however, there is no indication that the station would stop or reduce its power generation. As a result, the station would have to source coal from the broader coal market. If this occurred, the total generating rate at the Craig Generating Station would remain unchanged. As such, the emissions from the Craig Generating Station through 2019 would remain consistent with those reported to CDPHE for reporting year 2013 (the most recent available data) (**Table 4.3-43**).

Table 4.3-43 Criteria Pollutant Emissions Rates

Location	2013 APENS Annual Actual Pollutant Emissions (tpy)					
	PM_{10}	$PM_{2.5}$	CO	NO2	SO2	VOC
Craig Generating Station	172.2	121.1	1232.8	12091.0	3261.0	62.2

4.3.3.3 Indirect Coal Combustion GHG and Climate Change Impacts

Under the No Action Alternative, GHG emissions from the Craig Generating Station would remain consistent with the current emissions rates. The mine would no longer provide coal to the Craig Generating Station; however, there is no indication that the station would stop or reduce its power generation. As a result, the station would have to source coal from the broader coal market. If this occurred, the total generating rate at the Craig Generating Station would remain unchanged.

The Craig Generating Station would produce the GHG emissions detailed in **Table 4.3-44**. The calculations assume that the 2014 coal combustion at the Craig Generating Station would be a reasonably foreseeable level of combustion. Additionally, the table outlines the amount of GHG emissions generated from the contracted amount of coal that historically was provided by the Colowyo Mine.

Table 4.3-44 GHG Coal Combustion Emissions from the Craig Generating Station

Coal Combusted (Short Tons)		CO_2 Emissions (metric tonnes)	CH_4 Emissions (metric tonnes)	Total CH_4 in CO_2e (metric tonnes)	N_2O Emissions (metric tonnes)	Total N_20 in CO2e (metric tonnes)	Total CO_2e (metric tonnes)
4,604,403	2014 Coal Combustion	10,707,403	1,263	31,567	184	54,731	10,793,700
2,300,000	Current Colowyo Contract Annual Maximum	5,348,582	631	15,768	92	27,339	5,391,689

These values represent the calculated GHG emissions that occurred for the actual combustion activities at the Craig Generating Station during 2014 as well as the emissions attributable to coal provided from the Colowyo Mine. Under the No Action Alternative, the emissions from the Craig Generating Station would remain consistent with these current levels of emissions assuming that the same amount of coal is provided from another source than the Colowyo Mine. These emissions account for approximately 0.037 percent of estimated global emissions and between 0.18 percent of estimated U.S. net emissions. These levels are roughly equivalent to the levels that would be generated under Alternatives A and B.

4.3.3.4 Social Cost of Carbon

For the No Action Alternative, indirect GHG and carbon emissions from coal combustion at the Craig Generating Station and other regional combustion sources would remain unchanged from current emissions levels. As a result, there would be no net change to SCC for the No Action Alternative.

4.3.3.5 Ozone *Precursor Emission* Impacts

Under the No Action alternative, precursors of O_3 including NOx and VOCs would still be generated by the combustion of coal. Precursor emissions would be generated at Craig Generating Station in a manner and at a rate consistent with current facility emissions, assuming that the same amount of coal is provided from another source than the Colowyo Mine.

Table 4.3-45 presents the O_3 precursor emissions that were reported for the Craig Generating Station to CDPHE for the 2013 reporting year.

Table 4.3-45 Ozone Precursor Emissions Rates Based on the 2013 Craig Generating Station CDPHE Reported Emissions

Coal Combustion Rate (tpy)	NO_2 (tpy)	VOC (tpy)
4,604,403	12,091.0	62.2

Although the emissions rates for NOx are substantial from the coal combustion, if the regional O_3 reaction is limited by VOC emissions, even large amounts of NOx emissions do not lead to higher O_3 concentrations. There would be no emissions factor change (increase or decrease) in the production of O_3 precursors from any of the alternatives. Therefore, as discussed in **Sections 4.3.1.4** and **4.3.2.3**, regional O_3 concentrations would meet appropriate national standards.

4.3.3.6 Indirect Mercury Emissions

Under the No Action Alternative, the Craig Generating Station would continue to operate as currently permitted by the State of Colorado and EPA. No change in the electrical generating capacity or resultant emissions is anticipated as a result of the No Action Alternative. However, the Craig Generating Station would be required to source coal from the broader coal market to replace the coal currently provided by the Colowyo Mine.

Mercury emission for the Craig Generating Station was reported by the facility for all atmospheric emissions sources as presented in **Table 4.3-30**.

As previously described, emissions for the Craig Generating Station have changed significantly throughout the period since 2007 and the most recent TRI emissions available. This change is a result of the changing regulatory requirements for the facility. Emissions at the Craig Generating Station under the No Action Alternative would continue at annual rates similar to those detailed in **Table 4.3-30**. Based on data available from the TRI data explorer, the electrical generation sector in Colorado generated approximately 1,070 lbs of mercury emissions for reporting year 2013. The contribution of Craig Generating Station to the statewide mercury emissions is approximately 3.9 percent, a rate that would remain unchanged under the No Action Alternative, assuming that the same amount of coal is provided from another source than the Colowyo Mine.

4.3.3.7 Rail Car Emissions Impacts

Under the No Action Alternative, no coal would be transported from the mine. As a result, no emissions would be generated by rail travel or maintenance associated with coal transport from the mine.

4.3.4 Mitigation Measures

<u>Air Quality Mitigation Plan</u>

As part of Construction Permit No. 95MF1040, and No. 06RB131, Colowyo is required to submit an Air Quality Dust Mitigation Plan to the state. *Colowyo has submitted a Dust Mitigation Plan and its receipt was acknowledged by APCD on May 27, 2010. The plan is pending approval of a* *permit revision based on an ongoing ambient air quality analysis. Dust control practices currently utilized at Colowyo include, but are not limited to:*

- *Topsoil and overburden material is watered as necessary during the removal process to control fugitive dust.*
- Topsoil stockpiles are re-vegetated within one year.
- Vehicle speed on unpaved *haul* roads *is limited to a maximum of* 45 mph. Speed limit *signs are* posted.
- Unpaved haul roads are watered as often as needed to control fugitive *dust.*
- Magnesium chloride or other similar dust suppressants are applied to unpaved haul roads for fugitive dust control.
- Hood and/or water spray units are utilized during overburden and coal drilling to minimize dust.
- In response to elevated readings of PM_{10} at the TEOM continuous monitors, the mine site institutes operational shutdown procedures. Operational shutdown will remain in effect until climatic conditions improve.

4.4 GEOLOGY

4.4.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Alternative A would result in the removal of the recoverable coal in the South Taylor pit. Coal seams that would be mined via truck/shovel, dragline, and highwall miner techniques include the X and A through G789 seams (a stratigraphic depiction of the coal seams can be found in KEC [2005]). At the assumed production rate of 5.8 to 6 mtpy, up to 60 mt of coal would eventually be mined. This would result in obliteration of the geological column within the pit footprint; this effect would be a permanent effect on geologic resources within the Project Area. However, the Colowyo Mine coal removal would only remove a small portion of the geologic column and coal reserves associated with the Danforth Hills coal field, and an even smaller portion of the Rocky Mountain Coal Province of Tully, which contains the Danforth Hills coal field. Therefore, the effect would be negligible to minor but would be long term. At the end of mine life, the pit would be backfilled as part of closure and reclamation.

4.4.2 Alternative B – PR02 as Revised

4.4.2.1 Previous Impacts

The portion of PR02 completed to date has resulted in the removal of much of the recoverable coal in the South Taylor pit. Coal seams that have been mined via truck/shovel, dragline, and highwall miner techniques include the X34, A, B12, C35, D12, E2, F1, F356, Fab, G3, and G78 seams. Since 2008, Colowyo has mined between *1.2 and 1.8* mtpy from the South Taylor pit, for a total of about 10 mt. Removal of the coal in the Project Area has resulted in the obliteration of the geological column within the pit area as coal is removed.

4.4.2.2 Potential Impacts

As mining of the South Taylor pit continues, the pit would be enlarged minimally in areal extent, and volume to a greater extent. At the assumed production rate of 2.5 mtpy under Alternative

B, 11.8 mt of additional coal would eventually be mined. The impact on geological resources would be negligible.

4.4.3 No Action Alternative

Under the No Action Alternative, no mining would occur within the Project Area beyond September 2015. Impacts to the geological resources were incurred as a result of the mining activity and therefore under this alternative, geological resources in the area would remain as described in **Section 4.4.2.1.** Minor volumes of material would be removed or disturbed as a result of the reclamation activity and this activity would occur eventually (although at a later date) regardless of alternative.

4.4.4 Mitigation Measures

No mitigation measures would be necessary for geology.

4.5 WATER RESOURCES

4.5.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Under Alternative A, the South Taylor pit, the West Taylor valley fill, and the East Taylor valley fill (**Figures 3-5a and 3-5b**) would physically disrupt the uppermost channel reaches of Taylor Creek and its headwater tributaries. This physical disruption would be to non-perennial channel reaches and would occur through excavation or fill placement, rendering the channel nonfunctional in those locations. Further, a sediment pond (**Figures 3-5a and 3-5b**) would be constructed across Taylor Creek just downstream of the West Taylor fill. In addition to the direct Taylor Creek channel disturbances, Alternative A would disturb the upper portion of the West and East Taylor watersheds (**Figures 3-5a and 3-5b**) (597 and 88 acres, respectively) and additional acreage (503 acres) within the Good Spring Creek watershed (**Figures 3-5a** and **3-5b**). The only direct channel disturbances in the Good Spring Creek watershed would be within the headwater portions of small tributary channels where the pit would disrupt the drainage and where sediment ponds and diversions would be constructed. Additionally, several small springs and seeps would be disrupted by disturbances in the Taylor Creek and Good Spring Creek watersheds. Mining under Alternative A would not result in any disturbances of the Wilson Creek channel, its watershed, or springs within its watershed.

Channel disruptions, direct spring disturbances in the footprint which would eliminate several springs, potential indirect spring flow disruptions due to draining, and watershed disturbances could alter the local runoff characteristics and flow patterns in Taylor Creek and Good Spring Creek. Colowyo (2007) predicted that base flow in Good Spring Creek would be reduced by up to 7 percent during and for 45 years after mining, and that base flows in Taylor Creek would not be reduced. Overall, this would be expected to be negligible because: 1) of the headwater positioning of the disturbed area and the nature of the non-perennial flows, 2) the non-permanent nature of any reductions; and 3) because Colowyo has committed to avoiding reductions in base flows by not exercising their water rights if necessary (Colowyo 2007). CDRMS (2007; 2010) findings support this determination in that they found there would be no changes to the overall hydrologic balance.

The mining plan decision document for PR02 as Approved in 2007 (OSMRE 2007) included memoranda from USFWS discussing the water depletion associated with Alternative A. It described an annual water depletion of an additional (i.e., new) 27 acre feet that would result from the four new sediment ponds associated with PR02 as Approved in 2007. This depletion would not represent a true diversion, but it would remove a small proportion of water from the Yampa River watershed. Further, water for mining and related industrial activities would continue to be diverted under decreed water rights from Good Springs Creek and Milk Creek to Wilson Reservoir, as it currently is, for PR02 as Approved in 2007. This would be a continuing impact that was already occurring at the mine, but would be longer in time. Actual channel diversions associated with Alternative A would route flows around disturbances or through reclaimed lands; their use requires CDRMS approval, and as such, are designed in a manner that would not diminish downstream water rights (CDRMS 2007). Overall, these mining-related depletions and diversions associated with Alternative A would result in a negligible impact to water quantity in the Yampa River.

In addition to the mining-related diversions, the Craig Generating Station diverts water from area surface waters in much greater quantities than does the mine, which could be an indirect impact. That water comes from the Yampa River *and the* Elkhead Reservoir, as allowed by water rights, and transports that water to the plant where it is recycled for reuse in their process to the extent possible (Tri-State 2015b). It may also come from the Stagecoach Reservoir, if needed (CWCB 2009). Those plant-related diversions averaged about 12,000 acre-feet per year between 1980 and 2014 (CDSS 2015) and occur as allowed by valid water rights. During that same period, the mean of the average annual flows in the Yampa River (at USGS Station 09251000, *Yampa River near Maybell*, downstream of the plant and the mine) was 1,570 cfs (1.1 million acre-feet per year) (USGS 2015b). In addition, the Yampa River flows including the effects of diversions are considered in various management plans (CWCB 2009; CWCB 2012; CDW 2010). Further, there is an instream flow water right on the Yampa between Elkhead Creek and the confluence with the Green River (CWCB 2015), which also reduces potential effects from any diversions. Overall, the ongoing and continuing diversions would result in a negligible indirect impact to water resources in the area.

Transporting water associated with both the Craig Generating Station and with the mine is, and would continue to be, accomplished via buried pipeline. There would be no impacts associated with this transport because the flow is managed, contained, and there are no plans to reconfigure the pipeline (i.e., no additional disturbance).

The retention of the large majority of runoff produced on mine-disturbed land would protect downstream water quality. Any inadvertently spilled (e.g., during coal transport) or leaked fluids (i.e., hydrocarbons) as well as any coal fines, salts, or sediments (including iron-bearing components) transported by runoff would be properly contained and cleaned up, with reporting to appropriate agencies as required. Other BMPs (e.g., lined structures, spill training, berms) would reduce the potential for such incidents to occur. Further, operational water monitoring at some of the sites shown in **Figures 3-5a** and **3-5b** would also enable tracking of water quality to identify any unforeseen issues, which could then be rectified. Overall, the combination of structural and non-structural BMPs would reduce potential surface water quality impacts due to spills and erosion to negligible levels.

Groundwater impacts under Alternative A would include the interception and disruption of any small perched aquifers within the pit footprint. There would also be the potential for draining of spring flows near the pit. Due to their nature they are isolated small features, and their contribution to the overall hydrologic balance would be to supporting stream flow, which was analyzed within the flow reduction impact described above. Impacts to the regional bedrock aquifer would not be expected due to the distance between the ultimate pit bottom and the potentiometric surface (Colowyo 2007; CDRMS 2007; CDRMS 2010). The potentiometric surface of the uppermost regional aquifer underlies the lowest coal seam to be mined by approximately 590 feet. Impacts to the alluvial aquifer would not be expected (Petersen Hydrologic, LLC 2015). Petersen Hydrologic, LLC (2015) based their assessment on several factors, including in part: 1) finding no evidence of past impact to that aquifer from mining- and reclamation-related activities at the mine; and 2) finding that the recharge potential is low due to the mine's location in an upland area. Combined, impacts to groundwater resources would be negligible to minor.

Regarding the elevated iron concentrations in the Yampa River discussed previously in **Section 3.5**, little data are available to directly determine the potential for contributions from Alternative A, related coal transportation, or the Craig Generation Station. However, as described in **Section 3.5**, monitoring in Wilson, Taylor, and Good Spring creeks under the baseline conditions showed that total recoverable iron concentrations were often below the EPA aquatic life standard of 1.0 mg/L, but individual analyses were often greater than the standard, particularly in Wilson Creek (Colowyo 2007). Compliance records for Colowyo's existing NPDES permit can also be used to ascertain whether or not there have been impacts to downstream surface waters. This permit regulates surface water runoff collected from the mine area and contains effluent limitations for any discharge of these waters. This regulatory oversight helps to ensure that impacts to downstream water quality do not occur. Implementation of Alternative A would require that Colowyo comply with all effluent limits in their NPDES permit for all discharges from the disturbed areas and these limits would include iron limits as well as total suspended solids (TSS) limits. Management and/or treatment of TSS (e.g., via sediment ponds) and retention of storm water would help to ensure that iron bound within soil/sediment particles would not be released to receiving waters in concentrations exceeding limitations. Should iron-impacted waters be generated and need to be released, effluent limits would have to be met, and, if sediment ponds or other passive treatment measures are not effective Colowyo would be required to implement treatment. The Craig Generation Station would also be required to comply with their NPDES effluent limits for any discharges, and these limits include iron. There would be no reason to expect that this facility would not be able to meet its iron limit, based upon past history (EPA 2015b). Overall, iron loadings would likely be negligible.

Colowyo analyzes dissolved mercury concentrations in groundwater and surface water samples collected as part of their mine permitting requirements. Data prior to 2007 is summarized in **Table 4.5-1**. Almost all of those data range from 0.0001 to 0.001 mg/L and in all likelihood are actually less-than-laboratory reporting levels rather than true concentration variations, based upon an analysis of the Colowyo data (Colowyo 2015) and a review of the current laboratory reporting limits (Inter-Mountain Labs (IML) 2015). Neither the mine's nor the Craig Generating Station's NPDES permit has an effluent limit for mercury. The State of Colorado chronic aquatic life water quality standard for mercury is 0.01 micrograms per liter (0.00001 mg/L)

(CDPHE 2012b). Because the data reported by Colowyo have reporting levels that are greater than the standard, with all values less than those reporting levels, it is not possible to determine the degree to which, if any, the mine has in the past or would in the future under Alternative A contribute mercury to the Yampa River. As noted in **Section 3.5**, airborne mercury deposition can come from multiple sources, natural and human-caused, near and far. It is not possible to determine, with the information at hand, the proportion of mercury in Project Area streams or in the Yampa River that has or would result from this alternative directly or indirectly considering the Craig Generating Station. However, as discussed above in **Section 4.3** mercury would be released under Alternative A; and as such, some amount of this could be deposited in the Yampa River with some incremental addition to the baseline mercury concentrations. This amount cannot be quantified with available information; however, the resultant effect on fish has been determined to be moderate (**Section 4.8**).

Table 4.5-1 Summary of Pre-2007 Water Monitoring Data for Selected Parameters

Site ID[1]	Sampling Period (Pre-2007)	TDS		Iron (Fe) (dissolved)		Mercury (Hg) (dissolved)		Selenium (Se) (dissolved)	
		N[2]	mg/L	N[2]	mg/L	N[2]	mg/L	N[2]	mg/L
Groundwater									
A-6	1984-2006 for TDS, Hg and Se; 1996-2006 for Fe	63	180-930	39	0.01-1.82	62	0.0001-0.0165	62	0.001-0.007
Gossard_14	1983-2006	35	962-1810	35	0.01-29	35	0.0001-0.01	35	0.00-0.017
NGSW	1989-2006 for TDS, Hg and Se; 1996-2006 for Fe	70	780-1890	37	0.01-0.46	70	0.0001-0.001	70	0.001-0.015
Surface Water									
NUGSC	1992-2006	59	360-1610	78	0.01-8.54	67	0-0.001	67	0.001-0.36
LGSC	1982-2006	135	630-4050	122	0.03-4.27	115	0.0001-0.001	115	0.001-0.03
LTC	1983-2001	59	144-1930	59	0.01-132	55	0.0001-0.001	55	0.001-0.016

[1]See **Figures 3-5a** and **3-5b** for Locations
[2]n=number of observations

Colowyo analyzes dissolved selenium concentrations in groundwater and surface water samples collected as part of their mine permitting requirements. Data prior to 2007 is summarized in **Table 4.5-1**. Groundwater data collected generally quarterly from three wells in or near the Project Area showed selenium concentrations ranging from 0.001 mg/L to 0.017 mg/L. There was no pre-2007 data for the other groundwater monitoring sites. Surface water data were also collected generally quarterly; data from a site in lower Taylor Creek (*site* LTC) has consistently been at 0.005 mg/L (again, likely the reporting level), while data from sites in Good Springs Creek has been more variable. Lower Good Springs Creek (*site* LGSC) had a minimum concentration of 0.001 mg/L and a maximum selenium concentration of 0.03 mg/L, and North Upper Good Springs Creek (*site* NUGSC) selenium concentrations ranged from 0.001 mg/L to 0.036 mg/L. There was no pre-2007 data for the other surface water monitoring sites. Neither the mine's nor the Craig Generating Station's NPDES permit has an effluent limit for selenium. The chronic aquatic life standard for selenium is 0.005 mg/L (CDHPE 2012b), and the above record indicates that selenium pre-2007 was already higher than this standard.

The analysis shows that the effects on surface water quality would be limited to increased TDS in the base flow of Good Spring Creek. The (expected and worst case) analyses predict increases between 1.6 and 13.5 percent, with a composition dominated by increasing sulfate ions, over the course of several hundred years after the completion of mining (Colowyo 2007). Colowyo (2007) predicted the duration of the elevated TDS using saturation indices for groundwater samples from Project Area wells and spoils borehole geochemical data. The focus of the analysis was on sulfate, the relevant component of TDS that could potentially increase. Using the exhaustion time for pyrite, which would be the source of the sulfate, as well as the volume of the pile available, they derived estimates of the duration of the elevated TDS discharge ranging from 110 to 450 years (Colowyo 2007).

Reclamation bonding requirements as well as NPDES requirements would ensure that water quality is maintained throughout the reclamation phase of Alternative A. Over the long term, final reclamation would further reduce the potential for water quality impacts. Pits that have been backfilled after mining would result in surfaces that approximate the pre-mining topography and that are covered with topsoil and revegetated. During reclamation, drainage patterns would be re-established per the approved reclamation plan and the potential for water quality impacts would be further reduced in part because there would be less potential for erosion and spills. As per the reclamation plan and the PAP for PR02 as Approved in 2007, acid-forming waste is not an issue at the mine (Colowyo 2007); thus, there would not be a potential for acid-mine discharge to either surface water or groundwater. Backfilled pit surfaces and reclaimed spoil areas are designed (e.g., by grading and sloping measures) to reduce the potential for infiltration and percolation of meteoric water that could eventually pick up salts and reach alluvial aquifers and or downstream surface waters (Petersen Hydrologic LLC 2015). Any increase in the resultant dissolved solids concentrations in Wilson, Taylor, or Good Spring creeks would be negligible to minor (Colowyo 2007).

CCRs generated at the Craig Generating Station as part of the coal combustion process are placed into a CCR disposal site at the Trapper Mine. The disposal site is under the jurisdiction of SMCRA and is approved to receive CCRs under a Certificate of Designation from Moffat County, with regulatory oversight from CDPHE. The disposal site, CCR placement requirements, design features, operating criteria, monitoring and corrective action; closure and post-closure monitoring standards; and record-keeping and reporting requirements are regulated under SMCRA and CDHPE. Further, groundwater monitoring of the site has determined that metals of concern are present in low levels; however, limited permeability and infiltration has kept these concentrations to those observed elsewhere at the mine. Therefore, the potential indirect impact to groundwater as a result of the disposal of CCRs at the Trapper Mine is negligible.

Overall, potential impacts to water resources under Alternative A are expected to be negligible to minor.

4.5.2 Alternative B – PR02 as Revised

4.5.2.1 Previous Impacts

The South Taylor pit, the West Taylor valley fill, and the East Taylor valley fill have physically disrupted the uppermost channel reaches of Taylor Creek and its headwater tributaries. This physical disruption has been to *ephemeral or intermittent* channel reaches and has occurred through excavation or fill placement, rendering the channel nonfunctional in those locations. Further, a sediment pond has also been constructed across Taylor Creek just downstream of the West Taylor fill. In addition to the direct Taylor Creek channel disturbances, mining under Alternative B has disturbed approximately 650 acres within the upper portion of the West Taylor watershed. Similarly, the pit excavation has disturbed approximately 140 acres within the Good Spring Creek watershed. The only direct channel disturbances in the Good Spring Creek watershed have been in two small tributary channels where sediment ponds and diversions have been constructed. Additionally, several small springs and seeps have been disrupted by disturbances in the Taylor Creek and Good Spring Creek watersheds. While springs (**Figures 3-5a** and **3-5b**) were inventoried and mapped during baseline data gathering, they have not been included in water monitoring programs; thus, quantifying the previous impact of their disruption (direct or indirect) is not feasible. Mining under Alternative B has not resulted in any disturbances of the Wilson Creek channel, its watershed, or springs within its watershed.

Channel and spring disruptions and watershed disturbances may have altered the local runoff characteristics and flow patterns in Taylor Creek and, to a lesser extent, Good Spring Creek. While there are no flow monitoring records for any of the springs shown on **Figures 3-5a** and **3-5b**, there are flow records for pre- and post-2007 at three of the surface water monitoring stations shown. Based upon a review of water monitoring records (**Table 4.5-2**), changes in runoff characteristics and flow patterns cannot be confirmed with a simple statistical analysis due to the nature of the data sets. However Colowyo's analysis of the same data (Colowyo 2015) reports declining trend lines over time for both LTC and LGSC, and a slightly increasing trend line for NUGSC.

Table 4.5-2 Stream Flow Data Summary

Site ID[1]	Pre-2007 Flow Data				Post-2007 Flow Data			
	N[2]	Min (cfs)	Max (cfs)	Avg (cfs)	N[2]	Min (cfs)	Max (cfs)	Avg (cfs)
NUGSC	162	0.20	20	3.0	32	0.06	19.5	2.9
LGSC	281	0.06	47	4.1	32	0.49	22	3.8
LTC	169	0	6.3	0.4	32	0	1.2	0.7

[1]See **Figures 3-5a** and **3-5b** for locations
[2]n=number of observations

The monitoring records (Colowyo 2015) (**Tables 4.5-1** and **4.5-3**) also indicate that TDS may have increased in lower Taylor Creek (*site* LTC) compared to the records from the 1980s and

1990s. Colowyo's analysis of the same data (Colowyo 2015) shows a strong trend line for LTC, as well. However, it is important to note that LTC is located not only downstream of the South Taylor operations but downstream of the other Colowyo operations as well. TDS concentrations in Good Spring Creek (LGSC and NUGSC) exhibit wide seasonal variations and any overall trend cannot be determined with simple statistics. Colowyo's analysis of the same data (Colowyo 2015) reports increasing trend lines over time for both LGSC and NUGSC.

Table 4.5-3 Summary of Post-2007 Water Monitoring Data for Selected Parameters

Site ID[1]	Sampling Period (Pre-2007)	TDS		Iron (Fe) (dissolved)		Mercury (Hg) (dissolved)		Selenium (Se) (dissolved)	
		N[2]	mg/L	N[2]	mg/L	N[2]	mg/L	N[2]	mg/L
Groundwater									
A-6	2008-2014	28	630-730	28	0.05-1.23	28	0.001-0.001	28	0.002-0.005
A-7	2008-2014	27	990-2100	27	0.05-0.1	27	0.001-0.001	27	0.005-0.042
A-8	2008-2014	23	620-2040	23	0.05-0.36	23	0.001-0.001	23	0.005-0.035
Gossard_14	2008-2014	28	1500-1800	28	0.05-0.07	28	0.001-0.001	28	0.005-0.008
NGSW	2008-2014	28	1640-2100	28	0.05-0.13	28	0.001-0.001	28	0.005-0.005
MT-95-02	2008-2014	28	2020-2330	28	0.05-0.06	28	0.001-0.001	28	0.005-0.01
Surface Water									
NUGSC	2008-2014	28	770-1550	28	0.05-4.13	28	0.001-0.001	28	0.005-0.02
LGSC	2008-2014	28	870-1910	28	0.15-8.84	28	0.001-0.001	28	0.005-0.015
UWFGSC	2008-2014	28	380-910	28	0.05-7.9	28	0.001-0.001	28	0.005-0.016
LTC	2011-2014	10	1440-2910	10	0.07-2.72	10	0.001-0.001	10	0.005-0.005

[1]See **Figures 3-5a** and **3-5b** for locations
[2]n=number of observations

While with any similar operation, there is always the potential for an inadvertent spill or release (e.g., hydrocarbons) that could reach a stream channel and affect water quality, this has not happened with this Project to date, based upon information provided in personal communications with Colowyo *(T. Tennyson, personal communication, June 18, 2015). Colowyo has implemented a spill prevention, control, and countermeasures (SPCC) plan to prevent or minimize the impact of spills that may occur.*

Colowyo's NPDES permit includes three outfalls relevant to the Project (**Figures 3-5a** and **3-5b**). Since 2007, discharge of stormwater has not occurred at Outfall 009 (Section 16 pond, which treats runoff from the South Taylor area) and has only occurred once (in 2011) at Outfall 012 (Section 28 pond) when all effluent limits were met. Thus, there is no evidence to suggest that the receiving stream (Good Spring Creek) for either of these outfalls had its water quality impacted by the Project. Outfall 011 (West Taylor pond) drains to Taylor Creek. This outfall discharges nearly continuously as a result of a rock underdrain constructed in the pre-mine drainages that the permanent fill is placed in. According to personal communications with Colowyo *(T. Tennyson, personal communication, July 18, 2015)*, the drain captures water from several springs beneath Colowyo's disturbance footprint, as well as, potentially, some water collected in the pit. Generally, effluent limits are met at this outfall, though there have been rare exceedances of total iron and TSS limits under PR02 as Revised (described below).

Outfall 011's effluent limit for total recoverable iron is a 30-day average of 1.0 mg/L. This limit was exceeded at Outfall 011 once in 2008 (5.36 mg/L) and once in 2012 (1.21 mg/L) (EPA 2015b). These occurred in conjunction with higher than normal TSS concentrations. They likely represent an iron component to the particulates *and were* associated with storm *events (storm runoff)*[10]. More than 90 percent of the iron data reported from the near-continuous discharge of Outfall 011 shows iron concentrations of well below the NPDES permit limit. The NPDES permit is the means by which the state tracks Colowyo's compliance with the Clean Water Act. These isolated past exceedances are not likely to have resulted in any sustained impact to water quality in the Taylor Creek drainage or to waters further downstream (**Table 4.5-3**).

Dissolved mercury concentrations in streams monitored in or near the Project Area are all reported as 0.001 mg/L, which is likely to represent the reporting level rather than a true concentration (**Table 4.5-3**). Because this *reporting level* is greater than the aquatic life water quality standard, it is not possible to determine the degree to which, if any, Alternative B has contributed mercury to the Yampa River. Similar to Alternative A, **Section 4.3** explains that mercury has been released airborne; and as such, some amount of this could have been deposited in the Yampa River with some incremental contribution to its mercury concentrations. This amount cannot be quantified with the information at hand; however, the resultant effect on fish has been determined to be the same as for Alternative A (i.e., moderate [Section 4.8]).

Dissolved selenium concentrations in streams that have been monitored during the implementation of Alternative B are summarized in **Table 4.5-3**. They are all at or greater than the chronic aquatic life criterion. However, it is likely that the minimum values of 0.005 mg/L represent less than reporting levels; further, the baseline condition (**Table 4.5-1**) reports maximum selenium concentrations that are greater than would occur under Alternative B. Based upon this assessment, selenium impacts are unlikely to have occurred.

Several of the wells shown on **Figures 3-5a** and **3-5b** have been monitored both prior to 2007 and during operations. Those data for some of the key constituents are summarized in **Tables 4.5-1** and **4.5-3**. While a complete statistical analysis of this information would be complicated,

[10] CDPHE recently corrected improperly coded storm runoff data in EPA's database and applied the appropriate alternative effluent limits. Applying the alternate limit removed the iron and TSS limit exceedances in these instances (K. Morgan, personal communication, July 29, 2015).

Colowyo's analysis of the same data (Colowyo 2015) indicates that TDS has shown a likely negligible trend at A-6, a strong upward trend at Gossard Well (which is also down gradient of other Colowyo operations that were permitted prior to PR02), and a noticeable upward trend at NGSW. CDRMS (2010) notes that groundwater in the Yampa River watershed can have elevated concentrations of selenium and iron, among other constituents.

Other than an unquantifiable amount of groundwater discharging from perched aquifers of limited extent (the springs and seeps mentioned above, which have not been monitored) that have been disrupted under Alternative B, the South Taylor pit has not intercepted groundwater. This is because the potentiometric surface of the uppermost regional aquifer underlies the lowest coal seam to be mined by approximately 590 feet. *CDRMS (2007)* has determined that Colowyo did not need any points of compliance in the bedrock aquifer because there was no potential for it to be negatively impacted by the coal mining and reclamation activities within either the Project Area or the other ongoing operations. The regional bedrock aquifer is associated with the Trout Creek Sandstone; smaller perched aquifers are associated with the Williams Fork Formation. Conversely, CDRMS (2007) also determined that the alluvial groundwater systems along Wilson, Taylor, and Good Spring creeks might potentially be impacted. *Permit stipulation 7 required Colowyo to analyze that potential (CDRMS 2007). To that end,* Petersen Hydrologic, LLC (2015) *recently* examined surface water and groundwater data and evaluated whether or not Colowyo's activities had impacted alluvial groundwater and whether or not impacts would be likely in the future. *In a report not yet submitted to CDRMS, Peterson Hydrologic* found "no evidence to conclude that significant impacts to water quality in the alluvial groundwater systems resulting from mining- and reclamation-related activities at the Colowyo Mine have occurred" (Petersen Hydrologic, LLC 2015). The disposal of CCRs at the Trapper Mine has not resulted in degradation of groundwater above groundwater standards.

4.5.2.2 Potential Impacts

Continuing PR02 as Revised activities under Alternative B would not result in any additional channel or spring/seep disruption. These activities would only disturb an additional approximately 20 acres, which would all be within the upper portion of the West Taylor watershed. This incremental addition to the disturbed area would not cause any further alteration to local runoff characteristics and flow patterns in Taylor Creek beyond that which have already occurred. Sediment ponds that are currently in place would continue to treat runoff and prevent downstream sedimentation. Further, the NPDES permit would continue to be in effect, and based upon past records, future compliance with effluent limitations would be expected. The past direct and indirect impacts of water diversions and water transport would be similar to those under Alternative A.

The retention of the large majority of runoff produced on mine-disturbed land would continue to protect downstream water quality. Any inadvertently spilled or leaked fluids (i.e., hydrocarbons) as well as any coal fines, salts, or sediments transported by runoff would be properly contained and cleaned up, with reporting to appropriate agencies as required. Other BMPs would reduce the potential for such incidents to occur. Overall, the combination of structural and non-structural BMPs would reduce potential surface water quality impacts due to spills and erosion to negligible levels.

As described above, no additional loss of springs or seeps would be anticipated as a result of Alternative B, nor would additional interception of small perched aquifers be likely. Further, for the same reasons as described above, impacts to the regional bedrock aquifer are not expected. Due to the lower production rate and tonnage mined, Colowyo coal would represent less of the coal combusted at the Craig Generating Station, and therefore would contribute to less CCR disposal than under Alternative A. This would remain a negligible indirect effect. Future impacts to the alluvial aquifer would not be expected (Petersen Hydrologic, LLC 2015).

Over the long term, final reclamation would commence and effects would be equivalent to Alternative A.

Overall, potential impacts to water resources under Alternative B are expected to be negligible to minor.

4.5.3 No Action Alternative

Under the No Action Alternative mining would cease, and closure activities would commence. There would be no further disruption of Project Area stream channels, and no further effects to downstream flows or quality beyond those described in **Section 4.5.2.1**. Similarly, there would be no additional loss of springs or interception of groundwater. The reclamation plan would be implemented in a way to avoid excessive sediment loading, as well as loading of other parameters, even after the ponds no longer exist. The past direct and indirect impacts of water diversions and water transport would be similar to those under Alternatives A or B, but the indirect effects of water diversion from the mine would cease sooner. Impacts during and after reclamation would be the same as those described for the previous impacts, but would occur sooner than under Alternatives A and B.

Overall, potential impacts to water resources under the No Action Alternative are expected to be negligible to minor.

4.5.4 Mitigation Measures

No mitigation measures would be necessary for water resources.

4.6 VEGETATION

4.6.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Under Alternative A, *1,181* acres of previously undisturbed vegetation would be disturbed gradually as land is cleared for mining activities. These impacts would be short term and would range from negligible (riparian type) to major (aspen type) within the Project Area until reclamation replaced vegetation to approved reclamation plan (or improved) conditions (**Table 4.6-1**). Alternative A would also disturb 261 acres of previously disturbed land and 115 acres of land under partial or final reclamation from previously approved operations.

Table 4.6-1 Impacts to Previously Undisturbed Vegetation, Alternative A

Vegetation Type[1]	Acres Disturbed[2]	Percent of Vegetation Type Disturbed within the Project Area[3]
Mountain Shrub	715.8	18
Aspen	202.0	69
Sagebrush	236.7	10
Bottomland	21.8	27
Grassland	6.2	12
Pond	3.5	58
Riparian	1.0	3
Total	1187	

[1] Vegetation types include vegetation as well as other land cover classifications.
[2] May not sum to exact disturbance due to rounding.
[3] See Table 3.6-1 in Chapter 3 for acres of each vegetation type within the 7,115 acre Project Area.

Similar to what has already occurred in reclaimed portions of the Project Area, impacts to vegetation would be lessened by the implementation of design features (**Section 2.2.3**). These measures would include restoration of disturbed areas to the approved reclamation plan conditions, which include targets for improvement beyond existing conditions for other resources (e.g., wildlife or GSG habitat [**Section 4.9.1**]). Several growing seasons would be needed for revegetated areas to be restored to the PR02 as Approved in 2007 vegetation standards (Section 4.15 in Colowyo [2007]). Colowyo would continue to monitor reclaimed areas until they are released from bond liability.

Implementation of these measures would limit the potential impacts from the establishment of noxious or invasive species with the continued application of herbicides as described in the weed control plan in PR02 as Approved in 2007 (Colowyo 2007). Additionally, design features include protection afforded to vegetation resources from potential fugitive dust or spills of petroleum or other fluids from equipment.

4.6.2 Alternative B – PR02 as Revised

4.6.2.1 Previous Impacts

Table 4.6-2 describes the previous impacts to the various vegetation types within the Project Area.

Table 4.6-2 Previous Impacts to Previously Undisturbed Vegetation, Alternative B

Vegetation Type[1]	Acres Disturbed[2]	Percent of Previously Disturbed Vegetation Types within the Project Area[3]
Mountain Shrub	418.4	12
Aspen	186.1	64
Sagebrush	150.8	6
Bottomland	21.1	26
Grassland	9.7	19
Pond	3.5	58
Riparian	0.7	22
Total	790.3	

[1] Vegetation types include vegetation as well as other land cover classifications.
[2] May not sum to exact disturbance due to rounding.
[3]See Table 3.6-1 in Chapter 3 for acres of each vegetation type within the 7,115 acre Project Area.

Impacts to vegetation in the Project Area have been lessened by the implementation of design features (**Section 2.2.3**), primarily associated with approximately 66 acres of reclamation. To date, there have been no reported infestations of noxious weeds or impacts to vegetation from spills or fugitive dust in the Project Area.

4.6.2.2 Potential Impacts

Alternative B would result in short-term, negligible to minor impacts to vegetation until reclamation replaced vegetation to the approved reclamation plan conditions. The 20 acres of remaining disturbance under Alternative B would occur in the mountain shrub, aspen, and bottomland vegetation communities. The same design features (**Section 2.2.3**) and reclamation goals (Section 4.15 in Colowyo [2007]) would be applied as those under Alternative A.

4.6.3 No Action Alternative

Under the No Action Alternative, the additional disturbance (20 acres) would not occur. The previously disturbed areas would be reclaimed in accordance with the approved reclamation plan (**Appendix B)**. While the reclamation would occur in the same manner as Alternatives A and B, the No Action Alternative would result in reclamation being completed earlier.

4.6.4 Mitigation Measures

No mitigation measures would be necessary for vegetation.

4.7 WETLANDS

4.7.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Small wetlands that total 2.12 acres would be impacted under activities associated with Alternative A. Colowyo would have to obtain a USACE 404 Permit prior to disturbing those wetlands and would likely purchase compensatory wetland mitigation credits as part of that permitting process. This would result in negligible impacts to wetlands. There would not be any indirect impacts (e.g., changes to surface hydrology) to wetlands because environmental protection measures (stream buffer zones, erosion and sediment control, and stream flow maintenance) would minimize the chance for indirect effects to downstream wetlands.

4.7.2 Alternative B – PR02 as Revised

4.7.2.1 Previous Impacts

For wetlands that would be impacted under activities associated with PR02 as approved in 2007, Colowyo received a USACE 404 Permit (No. 20071185GB) before those wetlands were disturbed. As one of the conditions of that permit, in 2008, Colowyo purchased compensatory wetland mitigation credits for the loss of 2.12 acres of wetlands associated with the Project. Credits were purchased at a 1.5:1 ratio to enable the creation of 3.18 offsite wetland acres at a wetlands banking site in south Routt County. There has not been any indirect impact (e.g., changes to surface hydrology) to wetlands. There has not been any impact to riparian areas or other WOTUS.

4.7.2.2 Potential Impacts

No additional direct impacts to wetland, riparian, or WOTUS would occur. Environmental protection measures associated with the Project (stream buffer zones, erosion and sediment control, and stream flow maintenance) would continue to minimize the chance for indirect effects to downstream wetlands.

4.7.3 No Action Alternative

The effects to wetlands would be the same as under Alternative B.

4.7.4 Mitigation Measures

Mitigation measures have already occurred for wetlands with the *creation* of 3.18 acres of *offsite wetlands through the purchase of mitigation credits*. No additional mitigation measures would be necessary for wetlands.

4.8 FISH AND WILDLIFE

4.8.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Short-term impacts to wildlife would occur primarily through gradual loss of habitat and disturbance by mining and human presence. These impacts, as described below, would be minor to moderate. Areas of habitat that are lost due to mining and related activities within the Project Area would be reclaimed as soon as those areas are out of production. At the end of the Project, all habitat would be restored in accordance with the approved reclamation plan, which includes goals to replace or improve wildlife habitat. At the end of the Project, disturbance to wildlife as a result of noise (**Section 4.18**) and human activity would cease.

Big Game

Within the Project Area, Alternative A would remove *1,181* acres (17 percent) of mule deer summer range, 279 acres (20 percent) of mule deer severe winter range, *1,181* acres of elk summer and winter range (17 percent), and 184 acres (15 percent) of elk production (calving) area. This would be a minor to moderate, short-term impact on mule deer and elk range until reclamation replaced (or improved) these habitats within the Project Area. There would not be any impact to pronghorn *habitat.*

Although big game would tend to displace from areas being disturbed and away from active mining activities, based on observations at the existing mining operations within the mine boundary, both elk and mule deer have been shown to acclimate to the disturbance from mining operations (Colowyo 2011). Herds are commonly found on previously reclaimed areas that are adjacent to active mining operations*, including during calving season*.

Migratory Birds

Impacts to migratory birds within the Project Area could *include destruction of nests and eggs in unidentified nests if clearing activities occurred during nesting season and those nests were not found and subsequently avoided*. Disturbance to suitable habitat may affect nesting opportunities and migration and migratory birds would tend to be displaced from active mining areas; however, these habitats are available outside the Project Area, and, therefore, this impact would be *minor*.

Noise produced by mining operations may also affect migratory birds. Noise can interfere with establishment of breeding territories for songbirds that vocalize during breeding, or interfere with alarm calls of birds and mammals (Larkin 1996; USDI 2003). These impacts would be short-term and minor.

Raptors

Impacts to raptors could result from vehicle strikes and collisions with power lines*; these impacts* would be lessened from the implementation of design features (**Section 2.2.3**). Therefore, the primary impacts that may result to raptors under this alternative would be from loss of habitat and disturbance to individuals. Nesting locations and foraging habitat within *1,181* acres would be removed. Noise and human presence could disturb individuals that forage in the area. Nesting raptors are often sensitive to disturbance from human related activities. Raptors may often abandon nests with eggs or young increasing the potential for mortality from predation or intolerance to high or low temperatures. The amount of disturbance that an individual raptor will tolerate varies among species and individuals (CPW 2003). Impacts to nesting raptors could extend beyond the actual disturbance area up to 0.5 miles (0.8 km) away (CPW 2003). While 10 nest sites are located within the Project Area, only one is located within the disturbance footprint. This nest was last observed to be active in 1997 and was occupied by a Cooper's hawk (*Accipiter cooperii*) (Monarch 2000). *Under*

Alternative A, this nest would be *lawfully* removed *after young had fledged* which would be a negligible impact.

Reptiles and Amphibians

In addition to the loss of habitat, some mortality could occur from construction, mining activities, and vehicle operation. The loss of approximately 2.12 acres of wetlands could impact amphibian populations using these specific areas; however, compensatory wetland mitigation would replace similar habitat offsite.

Fisheries

While there are perennial streams within the Project Area (Wilson Creek), none occur where disturbance would take place. Therefore, there would be no direct impacts to fisheries from previous disturbance and mining activities. Implementation of design features (**Section 2.2.3**) would reduce the likelihood of sediment or a spill of petroleum products or hazardous materials reaching fish-bearing streams. Potential indirect effects to fisheries are provided in **Section 4.9**, specifically to the federally listed Colorado River fish*; the nearest habitat for Colorado River fish is located in the Yampa River approximately 11 miles (18 km) from the project area, and 17 miles (27 km) from proposed surface disturbance.*

4.8.2 Alternative B – PR02 as Revised

4.8.2.1 Previous Impacts

Short-term impacts (**Section 4.9.1**) to wildlife occurred primarily through the loss of habitat on 789 acres, including impacts to big game habitat. Previous impacts to big game habitat include the removal of approximately 789 acres (11 percent) of mule deer summer range, 66 acres (5 percent) of mule deer severe winter range, 789 acres (11 percent) of elk summer and winter range, and 90 acres (9 percent) of elk production (calving) area.

In addition to habitat loss, some species may have been displaced from the Project Area from the increased noise and human activity that has taken place since 2008. *Based on observations at the existing mining operation, big game have become accustomed to the disturbance and are observed adjacent to active mining areas.* Design features (**Section 2.2.3**) have reduced other possible direct and indirect impacts to wildlife, such as mortality related to vehicle strikes and *effects to raptors from power lines; there have not been any reported raptor impacts related to vehicle collisions or power lines since 2007.* No take of migratory birds has been reported to mine management since the initiation of mining in 2008 (T. Tennyson, personal communication, May 29, 2015). One raptor nest (**Section 4.9.1**) was *lawfully* removed as part of previous mining activities. Valuable habitat features such as foraging and cover vegetation have been replaced on 66 acres that have been reclaimed to date.

4.8.2.2 Potential Impacts

Overall, the incremental impacts to wildlife would be negligible under Alternative B. The remaining disturbance would impact an additional 20 acres within the Project Area. Impacts to wildlife and fish species would be the same as described in **Section 4.9.1**; however, the additional disturbance is unlikely to change these impacts from their current levels (**Section**

4.9.2.1). Design features (**Section 2.2.3**) would continue to be implemented to reduce the impacts to wildlife. Impacts from the cumulative disturbance would be offset by the large amount of similar habitat available outside the Project Area. The reclamation and restoration of disturbed habitat would be the same as under Alternative A. *Additionally, Colowyo would implement avian protection measures to avoid, minimize, and mitigate impacts to migratory birds, including bald and golden eagles. Measures would include pre-construction nesting surveys, adherence to CPW recommended buffer zones and season restrictions for raptors, if feasible, and coordination with CPW and USFWS for nests that cannot be avoided. Mitigation measures are further described in* ***Section 4.8.4****.*

4.8.3 No Action Alternative

Under the No Action Alternative, all mining related activities in the Project Area would cease and closure and reclamation would be initiated. There would be no further impacts related to habitat loss. The reclamation of wildlife habitat and the cessation of noise and human disturbance would occur earlier than under Alternatives A or B.

4.8.4 Mitigation Measures

To mitigate impacts for future mining related disturbance (grubbing and topsoil removal), Colowyo would implement an avian protection plan that outlines mitigation requirements for migratory birds. The plan would outline how Colowyo addresses active nests found in future disturbance areas, a protocol on nest location, and consultation with the appropriate state authorities. Mitigation measures in the avian protection plan would include:

- *No ground disturbing activities including grubbing and topsoil removal topsoil would occur from December 15 to July 15 to avoid the nesting season for migratory birds.*

- *Prior to commencement of grubbing and topsoil removal (after July 15), a nesting survey would be conducted no sooner than 72 hours prior to initiation of operations by a qualified biologist to identify active breeding pairs or potential nesting locations. Should the qualified biologist identify active nest(s) in the proposed mining disturbance area, ground disturbing activities within the CPW recommended buffer zone would not occur and Colowyo would immediately contact CPW to coordinate proper mitigation measures.*

4.9 SPECIAL STATUS SPECIES

4.9.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Design features (**Section 2.2.3**) would be implemented to reduce the impact to special status species. Areas of habitat that would be lost due to mining and related activities within the Project Area would be reclaimed as soon as those areas are out of production. At the end of the Project, all special status species habitat would be restored in accordance with the approved reclamation plan, which includes goals to replace or improve wildlife habitat. Disturbance to special status species as a result of noise and human activity would cease. Overall, the impacts to special status species are expected to be negligible under Alternative A.

Threatened, Endangered, and Candidate Species

Colorado River Fish

The nearest habitat for the Colorado River fish species is the Yampa River, approximately *11 miles (18 km) from the Project Area (17 miles [27 km] from any proposed disturbance)*. Due to the design features (**Section 2.2.3**) associated with Alternative A, it is unlikely that these species would be impacted by sediment or spills. The perennial stream in the Project Area (Wilson Creek) does not contain habitat for these species.

It is estimated that mining under Alternative A would result in the depletion of 424.5 acre-feet per year to the Yampa River. This depletion was anticipated to result in adverse impacts to the Colorado River fish species (USFWS 2006). The USFWS Biological Opinion for PR02 (USFWS 2007, **Appendix D**) contains the following discussion on impacts to the Colorado River fish from water depletions:

> A recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin was initiated on January 22, 1988. The Recovery Program was intended to be the reasonable and prudent alternative for individual projects to avoid the likelihood of jeopardy to the endangered fishes from impacts of depletions to the Upper Colorado River Basin. In order to further define and clarify the process in the Recovery Program, a Section 7 agreement was implemented on October 15, 1993, by the Recovery Program participants. Incorporated into this agreement is a RIPRAP which identifies actions currently believed to be required to recover the endangered fishes in the most expeditious manner.
>
> On January 10, 2005, the USFWS issued a final programmatic biological opinion (PBO) on the Management Plan for Endangered Fishes in the Yampa River Basin. The USFWS has determined that projects that fit under the umbrella of the Yampa River PBO would avoid the likelihood of jeopardy and/or adverse modification of critical habitat for depletion impacts. The Yampa River PBO states that in order for actions to fall under the umbrella of the PBO and rely on the RIPRAP to offset its depletion, the following criteria must be met:
>
> 1. A Recovery Agreement must be offered and signed prior to conclusion of Section 7 consultation.
> 2. A fee to fund recovery actions will be submitted as described in the Proposed Action for new depletion projects greater than 100 acre-feet per year (af/yr).
> 3. Reinitiation stipulations will be included in all individual consultations under the umbrella of this programmatic.
> 4. The USFWS and project proponent will request that discretionary federal control be retained for all consultations under this programmatic.
>
> The Recovery Agreement was finalized by the USFWS and the mine on March 3, 2007 in conjunction with the previous Section 7 consultation for the mine. As this project would deplete more than 100 af/year, recovery fees were collected from the mine. OSMRE has previously agreed to condition their approval documents to retain jurisdiction should Section 7 consultation be reinitiated. *Therefore, the USFWS concluded that the Proposed Action [PR02] meets the criteria to rely on the*

RIPRAP to offset depletion impacts and is not likely to jeopardize the continued existence of the species and is not likely to destroy or adversely modify designated critical habitat.

In addition to impacts from water depletions, the Colorado River fish may be indirectly impacted from the combustion of coal at local power generation stations. The nearest of these stations is the Craig Generation Station located along the Yampa River in Craig. Combustion of coal releases mercury into the atmosphere which may be deposited into habitat for the Colorado River fish directly, or onto adjacent land and subsequently washed into the river.

Mercury is a concern primarily to longer-lived fish species (e.g., Colorado pikeminnow) because it bioaccumulates within the tissue of individuals. Therefore, the longer an individual lives and absorbs mercury, the higher the levels within their tissues over time. Mercury can affect an individual's central nervous system, alter their behaviors (e.g., reduced predator avoidance), and disrupt the endocrine system resulting in reduced reproductive success (Lusk 2010). While the specific effects of mercury and other heavy metals on pikeminnow are known, the role these contaminants play on suppressing populations of the Colorado River fish are not well understood (USFWS 2011b).

Beckvar et al. (2005) suggested a threshold-effect level of ≤ 0.2 micrograms per gram (µg/g) wet weight mercury in whole body fish as being generally protective of juvenile and adult fish. The USFWS reported that 78 percent of the Colorado pikeminnow collected in Colorado had levels of mercury above the 0.2 µg/g level, including within the Yampa River Basin (Osmundson and Lusk 2012). Samples taken from pikeminnow in the Yampa River in 2006 had levels of mercury between 0.42 and 0.68 µg/g (CDPHE 2015c). Osmundson and Lusk (2012) found a range of 0.39 to 0.58 µg/g with a mean level of 0.48 µg/g in Yampa River pikeminnow. The mercury levels reported above are lower than what was reported for pikeminnow that were captured in 1960s from the Yampa River (Lusk 2010). In that study, archived fish samples from museums were tested using similar methods as the pikeminnow captured recently and compared to what was reported by Osmundson and Lusk (2012). That information was presented to the San Juan Recovery Program and indicated that fish collected in 1960 had mercury levels of approximately 0.62 µg/g, approximately 0.10 µg/g higher than current levels. It should be noted that due to the limited number of fish in the Yampa River, sample size for these studies is generally low (less than 10). Therefore, additional study is needed to be able to make an overall statement as to how mercury is currently affecting these species.

In addition to impacts to individual Colorado River fish, impacts would also potentially occur to those species designated critical habitats in the region. As with any other listed species with designated critical habitat, the critical habitat for the four fish species all contain the primary constituent elements (PCEs) that are required to be present and are determined to be necessary for the survival and recovery of the species. All four species' critical habitat contains the following PCEs (50 CFR 13378):

1. *Water: This includes a quantity of water of sufficient quality (i.e. temperature, dissolved oxygen, lack of contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for each species;*
2. *Physical Habitat: This includes areas of the Colorado River system that are inhabited or potentially habitable by fish for use in spawning, nursery, feeding, and rearing, or corridors between these areas. In addition to river channels, these areas also include bottom lands, side*

channel, secondary channels, oxbows, backwaters, and other areas in the 100-year floodplain, which when inundated provide spawning, nursery, feeding and rearing habitats, or access to these habitats;

3. *Biological Environment. Food supply, predation, and competition are important elements of the biological environment and are considered components of this constituent element. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the species. Predation and competition, although considered normal components of this environment, are out of balance due to introduced nonnative fish species in many areas.*

Mercury from the combustion of Colowyo coal at the Craig Generating Station that is deposited either directly or indirectly into the designated critical habitat for these species would have the potential to adversely impact the critical habitat. This would occur primarily by increasing the amount of contaminates present in those areas (PCE #1). It is difficult to quantify the level of this impact from Alternative A to critical habitats given the lack of information on where the mercury in the analysis area originates from. However, if it is assumed that only five percent of the mercury generated at the local generating stations is deposited into the analysis area (EPRI 2014), the impact directly from Alternative A may be minor. However, when added to the other regional and global sources of mercury deposited into the area, Alternative A may result in cumulatively adverse impacts.

*Emissions of mercury related to combustion at the Craig Generating Station dropped from 130 lbs/year in 2008 to 30 lbs./year in 2009 due to the installation of improved environmental controls at the Craig Generating Station; mercury emissions from 2010 to 2013 ranged between 42 and 43 lbs/year (**Section 4.3**). Given the amount of mercury that is present in the coal mined at Colowyo and the existing controls at the Craig Generating Station, an average amount of 36 lbs. of mercury would be emitted annually from the Station including the Colowyo coal mined under this alternative. While the prevailing winds would generally result in the deposition of the emitted mercury east of the Craig Generating Station and away from habitat for the Colorado River fish, it is probable that some of the mercury would be deposited in the Yampa River and have the potential to indirectly impact these species. Given that the current levels of mercury in pikeminnow in the Yampa River are above the 0.2 ug/g threshold for detrimental effects, these depositions would have an indirect impact on these species.*

Of the amount of mercury annually deposited in the analysis area (as well as the larger Yampa and White River Basins), it is reasonable to assume that some portion would deposit directly or indirectly into the Yampa or White Rivers or their tributaries. Some of this mercury would be converted into methyl mercury and thereby has the potential to adversely affect the Colorado River fish. However, because of a lack of data or modelling it is not possible to quantify the amount of mercury that would enter the Yampa and White Rivers, or be converted to methyl mercury. Therefore, at this time it is not possible to accurately predict the impact to the Colorado River fish or their habitat.

Due to the uncertainties in how mercury is potentially affecting the Colorado River fish species, it is difficult to draw a conclusion to impacts from Alternative A as some of the data appears to be contradictory. In a recent study, pikeminnow populations in the Yampa River were reported to be declining but had low mercury concentrations compared to other river segments (Osmundson and Lusk 2012). It should be noted that mercury levels in the Yampa River were still above the: human consumption advisory level of 0.3 µg/g wet weight set by the EPA; toxicity threshold of 0.2 µg/g wet weight (Beckvar et al. 2005); and, the 0.1 µg/g WW for the protection of fish eating birds and mammals (Yeardley et al. 1989). Conversely, pikeminnow in the White River had high levels of *mercury concentrations but the population was increasing (Osmundson and Lusk 2012). The increase in the pikeminnow population in the White River was attributed to upstream movement of juvenile pikeminnow that originated in downstream Green River reaches during 2006 and 2007 and not from reproduction occurring in the White River itself (Bestgen et al. 2010). Further studies are required to determine how mercury is affecting species in the Yampa and White Rivers before a conclusion may be drawn between Alternative A and impacts to the Colorado River fish and their critical habitats.*

In addition to mercury, impacts to the Colorado River fish from increases in selenium from the combustion of coal at the Craig Generating Station could occur. Selenium, a trace element, is a natural component of coal and soils in the area and can be released to the environment by the irrigation of selenium-rich soils and the burning of coal in power plants with subsequent emissions to air and deposition to land and surface water. Contributions from anthropogenic sources have increased with the increases of world population, energy demand, and expansion of irrigated agriculture. Selenium, abundant in western soils, enters surface waters through erosion, leaching, and runoff. While required in the diet of fish at very low concentrations (0.1 µg/g) (Sharma and Singh 1984), it is unknown if selenium is adversely affecting endangered fish in the Yampa Basin. Excess dietary selenium causes elevated selenium concentrations to be deposited into developing eggs, particularly the yolk (Buhl and Hamilton 2000). If concentrations in the egg are sufficiently high, developing proteins and enzymes become dysfunctional or result in oxidative stress, conditions that may lead to embryo mortality, deformed embryos, or embryos that may be at higher risk for mortality.

Reporting limits for selenium in water is generally one microgram per liter (µg/L) while the EPA has set the maximum contaminant level goal of 0.05 mg/L (50 µg/L) for human consumption. During sampling of the Yampa River between 1997 and 1998, levels between less than one and 4.8 µg/L were found near Craig, between less than one and 4.9 µg/L near Maybell, and less than one and 3.6 µg/L near Deerlodge Park (USGS 2001). The peak reported levels for these sites all occurred in March, possibly during the beginning of the snow runoff. Concentrations were less than 1 µg/L during May through October. However, it should be noted that selenium in water may be less important than dietary exposure when determining the potential for chronic effects to a species (USFWS 2014).

Of the four Colorado River fish species, selenium would disproportionately affect the razorback sucker more than the other three species. As with all sucker species, the razorback sucker is a bottom feeder and more likely to ingest selenium that has precipitated to the river bottoms.

While the reportable limit of selenium in water is 1 µg/L, the safe level of selenium for protection of fish and wildlife in water is considered to be below 2 µg/L and chronically toxic levels are considered to be greater than 2.7 µg/L (USFWS 2014). Excess selenium in fish have been shown to have a wide range of adverse effects including mortality, reproductive impairment, effects on growth, and developmental and teratogenic effects including edema and finfold, craniofacial, and skeletal deformities.

Combustion of coal at the Craig Generating Station could result in some amount of selenium being emitted and subsequently deposited. However, as it is not monitored as it is emitted, unlike mercury, there is no information as to how much is released. When selenium is present in flue gas, it tends to behave much like sulfur and is removed to some extent via SO_2 *air scrubbers in place and also absorbs onto alkaline fly ash that is subsequently removed by a fabric filter baghouse (EPRI 2008). Therefore, due to the lack of information available, it is unknown if selenium is impacting Colorado River fish species in the Yampa and White Rivers.*

Although formal Section 7 consultation with USFWS *was not* conducted for Alternative A, consultation on the effects of coal combustion and subsequent mercury *and selenium* deposition in the Yampa River Basin *was completed* for Alternative B (**Section 4.9.2.2**). *In general, impacts to the Colorado River Fish from mercury and selenium under Alternative A would be moderate.*

Greater Sage-grouse

The primary impact to GSG in the Project Area would occur from the direct disturbance and displacement of GSG individuals, direct loss of habitat, and a potential increase of predation from attracting mammalian predators (CGSSC 2008). *The use of perch deterrents would limit the potential for an increase in avian predation on this species.*

Construction and land disturbance under Alternative A would not disturb any of the PHMA that occurs within the Project Area (**Section 3.9.1.2**). However, 710.2 acres of GHMA habitat would be disturbed (**Table 4.9-1**)[11]. In addition to these direct impacts, recent (post-PR02 as Approved in 2007) consultation with CPW, BLM, and USFWS determined that indirect impacts would occur out to 900 meters (2,953 feet) from the edge of disturbance (B. Holmes, personal communication, June 25, 2014). This distance was determined based on several years of monitoring data from the Axial Basin, where the Colowyo Mine is located and GSG occur near existing mining. These short-term impacts to GHMA would be minor to moderate until successful reclamation occurred. Reclamation would focus on improving GSG habitat, including boosting available GSG forage and brood production, in disturbed areas. This would be a long-term benefit to GSG *and would lessen the impact to GHMA.*

Impacts to leks are unlikely to occur. The nearest active lek (SG4) to the disturbance footprint is approximately 4.5 miles (7.2 km) away and would not likely be impacted by mining activities in the Project Area given the distance and the topographic screening between the lek and the disturbance footprint. As there is no seasonal habitat for GSG that would be disturbed (**Table 4.9-1**) no impacts are anticipated to occur during nesting or brood-rearing periods.

Table 4.9-1 Disturbance to GSG Habitat, Alternative A

Habitat Designation	Acres Directly Disturbed	Percent of total habitat type directly disturbed	Acres Indirectly Disturbed within a 900 meter buffer[1]	Total Acres Disturbed (Direct & Indirect)
PHMA	0	0	0	0
GHMA	710.2	13	2,575.7	3,285.9
Production Area	0	0	0	0
Brooding Habitat	0	0	0	0
Winter Range	0	0	0	0

1. The buffer distance of 900 meters was determined based on telemetry data from marked GSG in the Axial Basin. The data show that GSG typically remain this distance from mining operations (B. Holmes, personal communication, June 25, 2014).

[11] Note that designations of PHMA and GHMA were not established at the time PR02 was approved in 2007.

Western Yellow-billed Cuckoo

As there is limited habitat within the Project Area for western yellow-billed cuckoos, impacts would be limited to those resulting from coal combustion and subsequent mercury emission at the Craig Generating Station. For the yellow-billed cuckoo, as with other riparian birds, mercury is accumulated through the ingestion of aerial insects emerging from benthic life stages in aquatic environments containing mercury or from associated predatory spiders (Cristol et al. 2008; Edmonds et al. 2012; Evers et al. 2012; Buckland-Nicks et al. 2014; Gann et al. 2014). Dietary total mercury concentrations associated with adverse effects to birds are generally greater than 0.1 mg/kg wet weight (DOI 1998). Once ingested, mercury rapidly moves into the bird's central nervous system, resulting in behavioral and neuromotor disorders (Tan et al. 2009; Scheuhammer et al. 2007, 2012). Therefore, adverse effects are described for the eggs, embryos, nestlings, and/or fledglings associated with elevated mercury burdens in the female parent and due to foraging.

No information is available on the levels of mercury in the Yampa River invertebrates within the region. However, it could be assumed that given the levels of mercury that currently exist in the Yampa River, that the aquatic invertebrates may contain elevated levels of mercury. Any yellow-billed cuckoos present in the analysis area would be at risk for mercury contamination. Therefore, Alternative A would have the potential to adversely affect this species. However, that risk would be low considering that the primary food sources for the cuckoo are generally not aquatic. Given the lack of sightings of this species within the analysis area since 2008, it is unknown how many individuals would have the potential to be affected. It is difficult to determine the level of impact given there is no threshold information for yellow-billed cuckoos as to what may be an acceptable amount of mercury in their systems without adverse symptoms. Information is also lacking on current, actual amounts of mercury in yellow-billed cuckoos that inhabit the region. Given the low numbers of cuckoos that are thought to reside in the area, it would be difficult to obtain this data.

Given that the yellow-billed cuckoo may not return to the same breeding areas in successive years, it is possible that if any individuals were impacted by mercury in one year, they may travel to a new location in subsequent years that are not impacted by mercury generated from the Craig Generating Station. Similarly, as cuckoos are migrants, they would not be present in the analysis area year-round, further reducing the potential for mercury contamination.

In addition to impacts to individual yellow-billed cuckoos, the proposed critical habitat for this species may also be impacted by Alternative A. The USFWS has designated critical habitat for the western yellow billed cuckoo along the Yampa River in the analysis area that contain the following PCEs (79 FR 48554):

1. *Riparian woodlands;*
2. *Adequate prey base; and,*
3. *Dynamic riverine processes*

Alternative A may have the potential to impact critical habitat through adverse impacts to the cuckoo's prey base. Different orders of invertebrates often react to mercury differently although in general insects in the larval stages are most susceptible to mercury. Levels of 1 to 10 µg/L normally cause acute toxicity for the most sensitive developmental stage of many different species of aquatic invertebrates (Boening 2000).

As stated above, Alternative A would result in some level of mercury deposition in the analysis areas. Some of this mercury may affect the invertebrates that make up the cuckoo's prey base, thereby affecting the proposed critical habitat (PCE #2). It should be noted, however, that aquatic insects and amphibians are not the primary food source for cuckoos. It is not known how much of the mercury deposited would be generated from Colowyo coal burned at the Craig Generating Station. Therefore, it is not possible to determine the severity of this impact to the proposed critical habitat.

Mercury is not anticipated to affect the cottonwoods or other riparian vegetation that comprises the majority of habitat for this species as wood plants are generally insensitive to the harmful effects of mercury (Boening 2000).

Overall, Alternative A would have minor impacts to the western yellow-billed cuckoo.

State Listed and BLM Sensitive Species

Great Basin Spadefoot

The primary impact to this species would occur from a loss of *952* acres of habitat. In addition to lost habitat, direct mortality could occur from Project activities e.g., vehicle strikes and earth moving. There is a large amount of suitable habitat for this species outside of the Project Area; therefore, Alternative A would result in minor short-term impacts until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat.

Ferruginous Hawk

Impacts to ferruginous hawks from Alternative A would occur primarily through a loss of *1,181* acres of foraging habitat. While there are no known nest sites within or near the Project Area, mining activities have the potential to prevent ferruginous hawks from nesting in the area. This species is known to be sensitive to human disturbance up to approximately 0.5 mile (0.8 km) (CPW 2003). There is a large amount of suitable and undisturbed foraging habitat for this species outside of the Project Area; therefore, Alternative A would result in minor short-term impacts until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat.

Mountain Plover

Impacts to the mountain plover would occur primarily through a loss of 10 acres of potentially suitable habitat. However, mountain plovers are known to be tolerant of human activities and use disturbed areas for breeding and foraging (CPW 2003). This would be a negligible impact on this species.

Bald Eagle

Mining within the Project Area would disturb *1,181* acres of foraging habitat for bald eagles. This is not likely to affect the carrying capacity for bald eagles in the region given the large amount of similar habitat that remains in the vicinity of the Project Area. However, mining may displace big game*, small mammals, and other food sources* in some areas, which may impact the bald eagle's ability to feed in and near the Project Area. Bald eagles may also be displaced from the Project Area due to noise and an increase in human presence; *however, bald eagles have been* *observed using the area adjacent to the mine haul road*. Design features (**Section 2.2.3**) would be employed that reduce the potential for *impacts to eagles from power lines. Activities under Alternative A would be likely to affect individual bald eagles through loss of foraging habitat, but are not likely to adversely affect nesting or roosting individuals and pairs given the lack of presence in the Project Area. Therefore, the impact to bald eagles would be minor to moderate until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat.*

Columbian Sharp-tailed Grouse

Impacts to the Columbian sharp-tailed grouse in the Project Area would occur primarily through the loss of *1,181* acres of habitat. Of the mapped habitat within the area, Alternative A would remove 216.8 acres of mapped winter habitat. This is approximately 6 percent of the mapped winter habitat within the Project Area. This species is considered to have a moderate tolerance for human disturbance (Hoffman and Thomas 2007),), and they have been observed using reclaimed mining lands at the mine (T. Tennyson, personal communication, September 15, 2014). This would be a minor, short-term impact to mapped winter habitat until successful reclamation. The reclamation strategy *of targeting GSG brood rearing habitat* would also benefit Columbian sharp-tailed grouse forage and brood production. There are no leks within 2 kilometers of the disturbance area; therefore, there would not be any impacts on brood production.

Burrowing Owl

Impacts to burrowing owls would occur primarily through a loss of *958* acres of habitat *that may contain holes for burrowing owls*. Design features (**Section 2.2.3**) would be employed that reduce the potential for *impacts related to power lines*. There is a large amount of suitable undisturbed habitat for this species outside of the Project Area; therefore, Alternative A would result in minor short-term impacts until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat.

American Peregrine Falcon

Impacts to peregrine falcons would occur primarily through a loss of *1,181* acres of foraging habitat. There is a large amount of suitable foraging habitat for this species outside of the Project Area; therefore, Alternative A would result in minor short-term impacts until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat. As this species nests in cliffs and bluffs overlooking waterbodies, there would not be a loss of nesting habitat because these areas do not occur in or near the Project Area.

Brewer's Sparrow

Impacts to the Brewer's sparrow would occur primarily through a loss of *953* acres of shrubland habitat. In addition to loss of habitat, any individuals nesting in the disturbance area could potentially suffer mortality if unknown active nests were inadvertently impacted. There is a large amount of suitable undisturbed habitat for this species outside of the Project Area; therefore, Alternative A would result in minor short-term impacts until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat.

Townsend's Big-eared Bat

Impacts to the Townsend's big-eared bat would occur from a loss of *1,181* acres of foraging habitat. *Direct impacts would be minimized through design features (**Section 2.2.3**).* Because mining activities occur 24-hours a day, mortality from vehicle or facility collisions could occur when bats forage on insects attracted to the lights used during night-time operations. There is a large amount of suitable undisturbed foraging habitat for this species outside of the Project Area; therefore, Alternative A would result in minor short-term impacts until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat.

White-tailed Prairie Dog

Impacts to white-tailed prairie dogs would occur primarily through a loss of *1,181* acres of habitat. In addition to lost habitat, individual white-tailed prairie dogs within the disturbance footprint may be killed during surface disturbing activities. There is a large amount of suitable undisturbed habitat for this species outside of the Project Area; therefore, Alternative A would result in minor short-term impacts until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat.

4.9.2 Alternative B – PR02 as Revised

4.9.2.1 Previous Impacts

Threatened, Endangered, and Candidate Species

Colorado River Fish

The nearest habitat for the Colorado River fish species is the Yampa River, approximately *11* miles (18 km) from the *Project Area (17 miles [27 km] from any proposed disturbance)*. Due to the design features (**Section 2.2.3**) in place, it is unlikely that these species have been impacted by sediment or spills. Mining activities conducted since 2008 have met the criteria to rely on the RIPRAP to offset depletion impacts to Colorado River fish, and thus are not likely to have jeopardized the continued existence of these species, and are not likely to have destroyed or adversely modified designated critical habitat (USFWS 2006).

*Impacts from mercury and selenium would be similar to those described under Alternative A. However, as less coal would be mined under Alternative B, there would be less mercury and selenium emitted from combustion at the Craig Generating Station so impacts would be less associated with Colowyo coal. Given the lack of information for these species, Colowyo has committed to conducting studies on mercury (**Section 4.9.4).** In a Biological Opinion prepared by the USFWS (**Appendix D),** the USFWS determined that Alternative B would likely adversely impact these species and their critical habitat, but would not jeopardize their continued existence. Therefore, impacts to Colorado River fish from Alternative B would be moderate.*

Greater Sage-Grouse

The primary impact to GSG from the Project has occurred from the direct disturbance and displacement of GSG individuals, direct loss of habitat, and a potential increase of predation from attracting mammalian predators (CGSSC 2008). *Perch deterrents would limit the potential for* *avian predation on this species.* Construction and land disturbance since 2007 has not disturbed any of the PHMA that occurs within the Project Area (**Section 3.9.1.2**). However, 665.9 acres of GHMA habitat has been directly disturbed and 2,144.6 acres have been indirectly disturbed (**Table 4.9-2)**.

There are no mapped leks present, therefore impacts to leks are unlikely to have occurred. As there is no seasonal habitat for GSG that has been disturbed (**Table 4.9-2**), no impacts are anticipated to have occurred during nesting or brood-rearing periods.

Table 4.9-2 Previous Disturbance to GSG Habitat

Habitat Designation	Acres Directly Disturbed	Percent of total habitat type directly disturbed in the Project Area	Acres Indirectly Disturbed within a 900 meter buffer[1]	Total Acres Disturbed (Direct & Indirect)
Preliminary Priority Habitat	0.0	0.0	0.0	0.0
Preliminary General Habitat	665.9	13.9	2,144.6	2,810.5
Production Area	0.0	0.0	0.0	0.0
Brooding Habitat	0.0	0.0	0.0	0.0
Winter Range	0.0	0.0	0.0	0.0

1. The buffer distance of 900 meters was determined based on telemetry data from marked GSG in the Axial Basin. The data show that GSG typically remain this distance from mining operations (B. Holmes, personal communication,, June 25, 2014).

<u>*Western Yellow-billed Cuckoo*</u>

Impacts from previous actions under Alternative B would be similar to those described for Alternative A. As there is little riparian habitat, no direct impacts would have occurred. The 2015 BO for this project concurred with the finding that there would be no adverse impacts to this species from Alternative B (Appendix D). Indirect impacts from mercury deposition from the Craig Generating Station are similar to Alternative A. However, as there is less coal combusted under Alternative B compared to Alternative A, the impacts would be lessened.

State Listed and BLM Sensitive Species

For all of the impacts described below (except mountain plover), Alternative B would result in minor short-term impacts until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat.

<u>Great Basin Spadefoot</u>

The primary impact to this species has occurred from a loss of *569* acres of potentially suitable habitat; reclamation has replaced 66 acres of this disturbance. In addition to lost habitat, direct mortality may have occurred from Project activities e.g., vehicle strikes and earth moving.

<u>Ferruginous Hawk</u>

Impacts to ferruginous hawks from Alternative B have occurred primarily through a loss of 789 acres of foraging habitat; reclamation has replaced 66 acres of this disturbance. While there are no known nest sites within or near the Project Area, mining activities have had the potential to prevent ferruginous hawks from nesting in the area. *Mitigation measures included as part of Colowyo's avian protection plan (**Section 4.8.4**), such as pre-construction surveys and nest buffers, would minimize any direct impacts to nests.*

Mountain Plover

Impacts to the mountain plover have occurred primarily through a loss of *13* acres of potentially suitable habitat. This would be a negligible impact on mountain plover. *Pre-construction surveys would be conducted prior to any future ground disturbing activities to ensure there are no impacts to breeding plovers in the Project Area.*

Bald Eagle

Activities since 2007 are likely to have affected bald eagles but are not likely to have adversely affected the species (USFWS 2006). Mining within the Project Area has disturbed 789 acres of foraging habitat for bald eagles; reclamation has replaced 66 acres of this disturbance. The impacts to bald eagle are similar to those under Alternative A although lessor in area. There are no known incidences of bald eagle mortality within the Project Area. Design features (**Section 2.2.3**) have been employed that reduced the potential for *impacts to eagles related to power lines. Additionally, Colowyo would implement mitigation measures as outlined in the avian protection plan in Section 4.8.4 to address potential impacts to eagles during future disturbance.*

Columbian Sharp-tailed Grouse

Impacts to the Columbian sharp-tailed grouse in the Project Area have occurred primarily through the loss of *786* acres of habitat; reclamation has replaced 66 acres of this disturbance. Approximately 253 acres (7 percent) of the habitat lost is mapped winter habitat.

Burrowing Owl

Impacts to burrowing owls have occurred primarily through a loss of *600* acres of habitat *that may contain holes for burrowing owls*; reclamation has replaced 66 acres of this disturbance. Design features (**Section 2.2.3**) have been employed that reduced the potential for *impacts related to power lines*.

American Peregrine Falcon

Impacts to peregrine falcons have occurred primarily through a loss of 789 acres of foraging habitat; reclamation has replaced 66 acres of this disturbance. As this species nests in cliffs and bluffs overlooking waterbodies, there has not been a loss of nesting habitat as these areas do not occur in or near the Project Area.

Brewer's Sparrow

Impacts to the Brewer's sparrow have occurred primarily through a loss of 569 acres of shrubland habitat; reclamation has replaced a portion of this disturbed habitat. *In order to avoid inadvertently impacting nests, Colowyo would conduct pre-construction clearance surveys in suitable habitat. If nests are identified, Colowyo would implement its avian protection plan*.

Townsend's Big-eared Bat

Impacts to the Townsend's big-eared bat have occurred from a loss of 789 acres of foraging habitat; reclamation has replaced 66 acres of this disturbance. *Implementation of design features (**Section 2.2.3**) that limit vehicle speeds have helped to minimize impacts to this species; however, the effects of mining operations on bat populations is unknown.* Because mining activities occur 24-hours a day, mortality from vehicle or facility collisions may have occurred when bats foraged on insects attracted to the lights used during night-time operations.

White-tailed Prairie Dog

Impacts to white-tailed prairie dogs have occurred primarily through a loss of 789 acres of habitat; reclamation has replaced 66 acres of this disturbance. In addition to lost habitat, individual white-tailed prairie dogs within the disturbance footprint may have been killed during surface disturbing activities.

4.9.2.2 Potential Impacts

Approximately 20 additional acres of land would be disturbed during the remaining life of the mine. These 20 acres occur primarily in the mountain shrub community. Therefore, the additional habitat lost would only affect those species that may occur in this habitat type. Impacts to special status species would be the same as described in **Sections 4.9.1** and **4.9.2.1** only less so because of less additional disturbed acreage. However, the additional disturbance under Alternative B is unlikely to change any impacts from their current levels due to the limited amount of additional acres involved. Design features (**Section 2.2.3**) would continue to be implemented to reduce the impact to special status species *and avian mitigation measures (**Section 4.8.4**) would minimize impacts to migratory birds.* Impacts from the cumulative disturbance would be offset by the large amount of similar undisturbed habitat available outside the Project Area as well as a reclamation plan that would restore disturbed areas back to wildlife habitat. Overall, the incremental impacts to special status species would be negligible under Alternative B. The reclamation and restoration of disturbed habitat would be the similar to that under Alternative A.

Formal Section 7 consultation on the effects of coal combustion and subsequent mercury *and selenium* deposition *on the Colorado River fish and western yellow-billed cuckoo* in the Yampa River basin under Alternative B is *complete. The final determination for the remaining potential impacts to the species is "Likely to Adversely Affect" but "not likely to jeopardize" the four Colorado River fish species, and "not Likely to Adversely Affect" the yellow-billed cuckoo. The potential impacts under Alternative B are the same as described above in **Section 4.9.2.1**. As part of the consultation process with USFWS, several conservation measures were committed to and are described below in **Section 4.9.4**.*

4.9.3 No Action Alternative

Under the No Action Alternative, all mining related activities in the Project Area would cease and closure and reclamation would be initiated. The impacts to special status species would be the same as under Alternatives A and B, but the reclamation of special status species habitat and the cessation of noise and human disturbance would occur earlier.

4.9.4 Mitigation Measures

Mitigation measures for special status species *and migratory birds are outlined in* ***Section 4.8.4****. Mitigation measures were developed during the preparation of the biological assessment associated with this project. Those measures would provide direct and indirect benefits to the Colorado River fish and western yellow-billed cuckoo.*

4.9.4.1 Colorado River Fish

Due to the uncertainty of understanding where the mercury that is being deposited into the Yampa and White River basins originates, Colowyo and Tri-State have committed to funding a study to further develop the knowledge of source attribution for future decision making. The overall goal of this effort is to improve the amount of information available to researchers and policy makers regarding mercury in the Yampa and White River basins.

The Electric Research Policy Institute (ERPI) would conduct an air quality deposition modeling analysis to determine the sources of mercury being deposited in the Yampa and White River basins. Mercury is a global pollutant and may undergo atmospheric transport over both short and very long (intercontinental) distances depending on its chemical form. The attribution of sources contributing to mercury deposition in the Yampa and White River basins would be determined from modeling conducted at multiple geographic scales: global, regional and local. A global mercury model, GEOS-Chem, would be applied to provide concentrations of mercury in the U.S. due to distant sources. The Community Multi-scale Air Quality model and the Community Multi-scale Air Quality - Advanced Plume Treatment model would be used to simulate emissions and deposition at a finer scale. At the local level individual sources would be modeled to determine their contribution to loading in the analysis area. The atmospheric models keep track of which sources or source categories contribute to eventual deposition by "tagging" or labeling each unit of mercury by where it originated. Tags are carried along with the calculations for deposition so that the analysis of deposited mercury into the local analysis area can show how much and from which sources. Deposition receptors would be identified in the local scale modeling. For comparison, in the modeling EPRI did in the Four Corners region (the San Juan River Basin project), the local scale power plants contributed 2 percent or less of the atmospheric mercury deposition (EPRI 2014). The deposition modeling and source attribution analysis for the Yampa and White River basins would be conducted similar to the deposition modeling and source attribution analysis performed for the San Juan River Basin Project. The analysis would consider anthropogenic and natural sources of mercury deposition and would model the transport, chemical transformation and deposition of mercury under both wet and dry conditions.

Information gathered from this modeling effort would fill an obvious gap in the information available for the protection of the Colorado River fish species. Results of the study would also be used as part of the adaptive management process.

Colowyo would also contribute $50,000 to the National Fish & Wildlife Foundation who would then distribute the money to the Endangered Fish Recovery Program's Upper Colorado River Fish Recovery Program. This measure would directly benefit the Colorado River fish species in the two rivers impacted by mining and combustion of coal mined at the Colowyo Mine. The funds are to be directed toward the control of nonnative fish species in both the Yampa and White River's designated critical habitat for the Colorado Pike Minnow, or to support other recovery activities that directly benefit the endangered fish such as habitat improvement.

4.9.4.2 Yellow-billed Cuckoo

While critical habitat has been proposed for the western yellow-billed cuckoo, there is a lack of specific information as to how much of the proposed critical habitat represents actual, high quality breeding/nesting habitat and how much represents foraging habitat for the cuckoo. Colowyo would fund an effort to delineate which portions of the proposed critical habitat along the Yampa River contain the key habitat suitability components for the cuckoo. Colowyo would have a habitat mapping methodology developed and implemented in coordination with the USFWS. The relevant scientific literature would be reviewed to determine the vegetation component, distance to water, and patch size requirements for the western yellow-billed cuckoo. Data to be used in this effort would come from existing data sets already developed and available. These include aerial imagery, Southwest Regional Gap Analysis habitat data, The Nature Conservatory and CPW habitat suitability data, and any other currently available agency data. A ground-truth effort on publically accessible land would be conducted to facilitate the assessment of vertical integration of the mid-story vegetation layers that are difficult to detect remotely. The final product of this effort would include reporting on established methods, results, and GIS mapping of the proposed critical habitat into areas of "good," "moderate," and "unsuitable" habitat classifications.

4.10 CULTURAL AND HISTORIC RESOURCES

The APE for cultural resources is the Project Area. This includes all associated mine-related facilities including the overburden stockpiles, access roads, power lines, water lines, sediment pond, diversion ditches, etc., and the haul road to the load out facility.

NRHP-eligible (i.e., historic properties) and cultural resource sites that require additional testing to determine eligibility ("needs data") may be directly or indirectly impacted by surface disturbing activities or the construction of associated infrastructure. "Needs data" sites are managed as though they are eligible for the NRHP until further evaluated. Indirect impacts may include increased soil erosion and gullying, vibration from blasting, and dust from operations. In addition, there would be increased potential for unlawful artifact collection and/or vandalism of cultural resources. Other indirect impacts may include degradation of the site setting, thereby detracting from the viewshed and historic feeling of nearby cultural resource sites.

There are no NRHP-eligible cultural resource sites within the APE; however, three "needs data" sites are present within the APE (**Table 4.10-1**).

Table 4.10-1 NRHP-Eligible and "Needs Data" Cultural Resource Sites within APE

Site Number	Site Type	Cultural Affiliation	NRHP Evaluation	Within area of proposed disturbance?
5MF1652	Open camp	Prehistoric	Needs Data	No - Outside
5MF4003	Open camp	Prehistoric	Needs Data	No - Outside
5MF4010	Lithic scatter	Prehistoric	Needs Data	No - Outside

4.10.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Of the three "needs data" sites within the APE, none would be directly impacted by Alternative A.

"Needs data" sites that are outside the proposed disturbance areas but within the permitted mine boundary would be avoided. For the sites that occur outside the area of proposed disturbance, there would be no adverse effect from the undertaking as proposed. If any of these sites cannot be avoided, a testing program would be initiated to determine their NRHP eligibility.

4.10.2 Alternative B – PR02 as Revised

4.10.2.1 Previous Impacts

The APE was inventoried (TRC Mariah 2006) for cultural resources prior to PR02 as Approved in 2007 (**Section 3.11**). No NRHP-eligible or "needs data" sites have been impacted by the mining activities associated with PR02 as Revised.

4.10.2.2 Potential Impacts

Of the three "needs data" sites within the APE, none would be directly impacted by Alternative B. However, all three are adjacent to existing roads. Any impacts to these sites would constitute an adverse effect.

Sites that are outside the proposed 20-acre additional disturbance area but within the permitted mine boundary would continue to be avoided. For the sites that occur outside the area of proposed disturbance, there would be no adverse effect from the undertaking as currently proposed. If any of these sites cannot be avoided, a testing program would be initiated to determine their NRHP eligibility.

In accordance with 36 CFR 800.3 and NHPA Section 106, a letter was mailed on June 17, 2015 (**Appendix E**) seeking consultation with the SHPO, tribes, and other interested parties, notifying them of the undertaking, and requesting comments or concerns. Tribal consultation is presented in **Section 4.12**. A June 3, 2015 response (**Appendix E**) stated that SHPO "does not have additional concerns at this time for the South Taylor Permit Area." With implementation of the Cultural Resource Protection stipulations, there would be no adverse effect to NRHP-eligible or "needs data" cultural resources.

4.10.3 No Action Alternative

Under the No Action Alternative, mining would cease and closure and reclamation would be initiated. No additional disturbance beyond the existing disturbance footprint would occur. Therefore, there would be no impacts to NRHP-eligible or "needs data" cultural resource sites.

4.10.4 Mitigation Measures

<u>Discoveries</u>

If a previously unidentified cultural resource is discovered in the Project Area, Colowyo would take measures to protect the cultural resource and provide written notice to the CDRMS and the OSMRE within 48 hours. A Colorado-permitted archaeologist meeting the Secretary of the Interior's Professional Qualifications Standards would, as soon as possible, evaluate the discovery, make a recommendation as to NRHP eligibility of the resource, and provide written notice to the CDRMS and the OSMRE within 48 hours. The CDRMS and OSMRE would then consult with the SHPO and the BLM (for federally managed sites) on NRHP eligibility determinations and to develop appropriate measures necessary to mitigate the effects through the development of a treatment plan.

Should the discovery involve a burial or a resource thought to have potential religious and cultural significance such as a Traditional Cultural Property, the tribes with an interest would be notified and consulted with as appropriate. When agreement is reached between all parties involved, the appropriate mitigation measures, if necessary, would be implemented. The tribes, OSMRE, CDRMS, SHPO, and the surface landowner must agree to the treatment measures.

Human Remains

If human remains are exposed during mining activities, these activities would be halted at once in the vicinity of the discovery. The remains would be covered over and stabilized, and access to the immediate area would be blocked by flagging and/or temporary fencing. Operations would cease for 100 feet in all directions around the site of discovery.

Unmarked burials located on private or state land would be treated under CRS 24-80-401 and CRS 24-80-1301. Colowyo would contact the County Sheriff, the County Coroner, and the appropriate land management agency to notify them of the discovery. The Coroner would investigate the discovery within 48 hours and may enlist the assistance of a physical anthropologist, archaeologist, or other specialist to determine if the remains are of forensic interest. If the remains are not of forensic interest, the Coroner would contact the Office of the State Archaeologist (OSAC) at History Colorado. OSAC would then contact the land management agency and the Colorado Commission of Indian Affairs (CCIA) to formulate a treatment plan within 10 days of the discovery. OSAC and CCIA would coordinate Native American Tribal notifications and subsequent consultations. Colowyo would comply with the directives of OSAC and CCIA with respect to archaeological treatment of the remains.

For unmarked burials identified on federally managed lands, the requirements of the Native American Graves Protection and Repatriation Act (NAGPRA) would apply in accordance with 43 CFR 10.

4.11 INDIAN CONCERNS

4.11.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Various tribes and tribal organizations were contacted in 2007 regarding Alternative A (**Appendix E**). No concerns were raised regarding any specific religious site, sacred site, or traditional cultural property. No impacts to Indian concerns have been identified related to Alternative A.

4.11.2 Alternative B – PR02 as Revised

4.11.2.1 Previous Impacts

No impacts to Indian concerns were identified related to the mining activities associated with PR02 since 2007.

4.11.2.2 Potential Impacts

Scoping letters describing the Project were sent to the Eastern Shoshone Tribal Council, Ute Mountain Ute Tribal Council, Ute Indian Tribe Tribal Council, and the Southern Ute Tribal Council on May 21, 2015. An additional consultation letter was sent to the tribes on June 17, 2015 noting the SHPO's current status of no new concerns and requesting any specific concerns they may have regarding the Project under the NHPA (**Appendix E**). To date, none of the tribes responded that the proposed project would have an impact on their tribal concerns.

4.11.3 No Action Alternative

Under the No Action Alternative, mining would cease and closure and reclamation would be initiated. No additional disturbance beyond the existing disturbance footprint would occur. Therefore, there would be no impacts to Indian concerns.

4.11.4 Mitigation Measures

No mitigation measures would be necessary for Indian concerns as no Indian concerns have been identified.

4.12 SOCIOECONOMICS

4.12.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Under Alternative A, mining would occur at a rate of 5.8 to 6.0 mtpy. At this production rate, 55 to 105 more personnel than are currently employed at the mine would need to be hired and additional equipment operated. Annual payroll, insurance, and retirement contributions; local expenditures; taxes; and royalty payments would increase from those currently provided by Colowyo (**Section 3.12**). For the relatively small communities near the Project Area, the sources of revenue directly related to the mining operation at Colowyo represent a large portion of the revenue coming into the area. Indirectly, secondary businesses such as grocery stores, retail shops, restaurants, and hotels benefit from these sources of revenue to employees. *The Craig Generating Station, which burns Colowyo coal, has an indirect effect on the socioeconomics of the area by also contributing wages, insurance, taxes, retail spending, housing requirements, etc.*

These effects would be moderate to major, short-term, beneficial impacts on socioeconomics. These increased economic contributions to the Project Area would extend to 2017, when the mine is estimated to cease operations under Alternative A. After closure begins, there would be approximately 18 employees remaining to conduct closure and reclamation, but the economic contribution directly or indirectly related to the Project Area would be much less than during active mining operations. The area has become relatively dependent on the economic contribution of the mine, so the loss of this portion of the economy would be acute and adverse unless Colowyo expands to an area outside the Project Area. Further, the area's demand and expansion of housing, social services, schools, and businesses have largely been driven by the development of the mine since 1977. Once all active mining operations both inside and outside the Project Area have ceased, this same level of services would not be needed, leaving an excess of housing and likely cuts to social services such as police, fire, and health care.

Once all active Colowyo mining operations have ceased, the State of Colorado would not collect severance taxes from Colowyo ($1,285,287 in 2014) (negligible impact). Federal coal lease royalty payments would not be collected from Colowyo ($9.5 million per year on average 2010-2014) and 49 percent of those funds would not be dispersed to the State of Colorado and the affected counties ($4.77 million per year on average) (negligible impact on Colorado, minor to moderate long-term impact on the affected counties).

4.12.2 Alternative B – PR02 as Revised

4.12.2.1 Previous Impacts

The mine has been operating within the Project Area since 2008, and has been affecting the socioeconomics of Moffat, Rio Blanco, and Routt counties since that time and since the mine's first development in 1977. A small increase in the number of employees (294 to 316, 7.5 %) occurred between 2006 and 2009 after the previous approval of PR02; however, the number of employees has since decreased to 220 in 2014 (T. Tennyson, personal communication, July 10, 2015). The economic contributions of the mine extend beyond these counties when secondary businesses such as equipment manufacturers and suppliers are included.

4.12.2.2 Potential Impacts

Under Alternative B, mining is anticipated to continue with approximately the same number of personnel (220), the same mining rate, and the same equipment as is currently being used for the existing mining operation on the Project Area. No additional demand for housing or municipal services would be anticipated. Mining operations would be extended throughout the life of the Project; therefore, the current socioeconomic conditions would extend to 2019. The extension of mining operations would extend the annual payroll, insurance, and retirement contributions ($29 million per year); local expenditures; taxes ($1.4 million per year); and royalty payments ($4.77 million per year) to the affected counties which would be $70 million more than the life of the mine under Alternative A. This would be a moderate short-term impact. After closure begins, there would be approximately 18 employees remaining to conduct closure and reclamation, but the economic contribution of the Project Area would be much less. The closure of the mine on the area's housing, services, and economy would be the same as under Alternative A but it would likely occur at least two years later. The State of Colorado would receive less severance taxes per year under Alternative B due to the lower production rate and lower tonnage mined, but those severance tax payments would be received for two years longer than under Alternative B. This impact would be negligible.

4.12.3 No Action Alternative

Under the No Action alternative, mining would cease and closure activities would begin in the Project Area. There would be an immediate and substantial decrease in economic contributions to the analysis area, if no additional mine expansions are permitted and approved. Approximately 200 direct jobs and associated payroll, insurance, and retirement contributions would be lost if no additional mining takes place. The housing market and school enrollment in Craig and Meeker would decline as many of the current Colowyo employees would need to leave the area to find job opportunities elsewhere. This would also reduce the amount of local expenditures by mine employees and their families and taxes in these communities that would create further job losses to secondary businesses.

Under the No Action alternative there would be no additional mining, thus no additional severance taxes paid to the State of Colorado, and no royalties paid to the federal, state, and local governments. This would lead to decreased funding to local governments for infrastructure maintenance and development. By closing two years (Alternative A) or four years (Alternative B) earlier under the No Action alternative, socioeconomic changes would occur earlier and the economic loss to the local community would be at least $70 million when compared to Alternative A and approximately $140 million when compared to Alternative B, if no additional mine expansions are permitted and approved. These would be major, long-term impacts to the socioeconomics of the local area and minor impacts to the State of Colorado.

4.12.4 Mitigation Measures

No mitigation measures would be necessary for socioeconomic resources.

4.13 VISUAL RESOURCES

Over the course of mining operations in the Project Area, impacts to visual resources would occur through observable changes in the topography, color, and texture of the lands in the Project Area, and through indirect visibility of mining operations by the presence of dust. Most of the disturbance in the Project Area (ground level disturbance and pit disturbance) would not be visible to the majority of viewers who are traveling on area *roads*, either because topography surrounding the Project Area blocked views of the Project Area or because the Project Area is at a higher elevation than viewers.

Viewers on State Highway 13 and *Moffat County Road* 51 south of and parallel to the Project Area would not be able to see mining disturbance because the highways follow drainages and are lower in elevation than the Project Area; topography blocks views of the mine. Similarly, because viewers on the highways are in an enclosed landscape, dust from the mining operation may not be visible or noticeable.

4.13.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Views from State Highway 13 *and Moffat County roads 17* and 32 north of the Project Area are open and panoramic; however, intervening topography blocks views of most of the ground level disturbance in the Project Area, so mining and reclamation are not visible to viewers in these locations. Because the views north of the Project Area tend to be more open and panoramic, dust rising from the mining operation or reclamation may be noticeable and attract the attention of viewers traveling on *these roads*.

As a result of mining in the Project Area, there would be two permanent valley fill areas and two temporary spoil piles. The East Taylor permanent valley fill would be constructed to an elevation of 8,050 feet amsl. The West Taylor permanent valley fill would be constructed to an elevation of 8,400 feet amsl. The East Taylor temporary spoil pile would be constructed east of the East Taylor permanent valley fill, to an elevation of 8,300 feet amsl. The West Taylor temporary spoil pile would be constructed on top of the East Taylor permanent valley fill to an elevation of 8,300 feet amsl.

The viewshed analyses below were conducted to determine the visibility of the permanent valley fills and the temporary spoil piles. One analysis had the general purpose of determining visibility using the highest elevation of valley fill (representing the maximum distance from and amount of the valley fill that could be seen), and the other for determining visibility using the highest elevation of temporary spoil (representing the maximum distance from and amount of the spoil that could be seen) for the other.

4.13.1.1 Short-term Visual Impacts

Viewers traveling on Moffat County Road 32 would have brief intermittent views of the temporary spoil piles when approaching the intersection with Moffat County Road 51, looking south. Viewers traveling on *Moffat County Road* 17 north and State Highway 13 east of the Project Area would have extended but intermittent views of the temporary spoil piles constructed to a maximum elevation of 8,300 feet. Views of the temporary spoil piles would be as part of a panoramic landscape, looking in a southerly direction from distances ranging from 6 to 12 miles (10 to 19 km) away. Viewers would see the tops of the spoil piles, which may appear to have a form, or be of a color or texture that is not consistent with the surrounding undisturbed lands, making them noticeable. Dust rising from the mine may attract attention when visible. At *higher* speeds, the amount of time the spoil piles are visible would be extended but intermittent. Frequent travelers along these routes may notice changes in the landscape as the spoil piles come into view and as they increase in elevation. Transient travelers may find the visible disturbance and dust noticeable. Because of the panoramic nature of the views and the ability of the landscape to absorb the changes that are of limited scope, the impact to visual resources would be minor and would meet Class IV objectives.

4.13.1.2 Reclamation and Permanent Visual Impacts

During the reclamation process, the spoil material in the temporary spoil piles would be used to backfill the pit over a several year period. Over that time, the spoil piles would be gradually reduced and existing impacts to visual resources from the visibility of the spoil pile would be gradually reduced until the temporary spoil piles are no longer visible; however the permanent valley fills, constructed to a maximum elevation of 8,400 feet amsl, would remain and be visible in the landscape similar to but less than the temporary spoil piles. Frequent travelers on the *routes* that are accustomed to seeing the spoil piles may notice the change in the landscape and it may attract attention, as would ongoing dust generated by ground-disturbing activities. Permanent views of the valley fills would be brief for travelers on Moffat County Road 32 in the vicinity of the junction with Moffat County Road 51, and would be extended but intermittent along State Highway 13 east and *Moffat County Road* 17 north of the Project Area. Transient travelers may find the visible disturbance and dust noticeable. Upon completion of reclamation, hunters or recreationists in close proximity to the reclaimed mine would continue to see obvious and noticeable disturbance to visual resources, despite the fact that post-mine topography would be developed in accordance with the approved reclamation plan and the area would be revegetated. However, the overall impact to visual resources would be minor and meet Class IV objectives.

4.13.2 Alternative B – PR02 as Revised

4.13.2.1 Previous Impacts

Views from State Highway 13 *and Moffat County roads* 17 and 32 north of the Project Area are more open and panoramic; however, intervening topography blocks views of most of the disturbance in the Project Area, so it is not visible to viewers in these locations. Because the views north of the Project Area tend to be more open and panoramic, dust rising from the mining operation may be noticeable and attract the attention of viewers traveling on *these roads*.

As a result of mining in the Project Area, there are two permanent valley fills and two temporary spoil piles. The West Taylor permanent valley fill is constructed to an elevation of 7,950 feet amsl. The West Taylor spoil pile is complete and constructed to 8,200 feet amsl in elevation. The East Taylor permanent valley fill is constructed to an elevation of 7,990 feet amsl. The East Taylor spoil pile is slightly lower.

The visibility of the temporary spoil piles would result in short-term impacts to visual resources while the piles are present, and the permanent valley fills would result in long-term impacts to visual resources. Visibility was determined using the highest elevation of temporary spoil (representing the maximum distance from and amount of spoil that can be seen highest elevation of valley fill for one) and the highest elevation for valley fill for the other (representing the maximum distance from and amount of the valley fill that can be seen).

4.13.2.2 Temporary Visual Impacts

Viewers traveling on State Highway 13 *and Moffat County roads* 17 and 32 north of the Project Area have brief intermittent views of the temporary spoil piles as a part of a panoramic landscape, looking in a southerly direction from a distance ranging from 6 to 12 miles (10 to 19 km) away. Viewers are seeing the tops of the temporary spoil piles, which may appear to have a form or be of a color or texture that is not consistent with the surrounding undisturbed lands, which could make them noticeable. Dust rising from the mine may attract attention when visible. At *higher* speeds, the amount of time the temporary spoil piles are visible would be limited. Frequent travelers along these routes may have noticed changes in the landscape as the temporary spoil piles came into view as they increased in elevation. Transient travelers may find the visible disturbance and dust noticeable. Because of the panoramic nature of the views and the ability of the landscape to absorb the changes that are of limited scope, the impact to visual resources is minimal and would meet Class IV objectives.

Hunters or other recreationists in close proximity to the mine, while likely few in number, have more comprehensive views of the mining disturbance. The mining disturbance from these views has changed the topography, land forms, colors and textures in the view; it is obvious and commands attention. However, the disturbance would meet Class IV objectives.

4.13.2.3 Potential Impacts

Mining

Potential impacts to visual resources would include continued visibility of dust and increase in height of the East Taylor temporary spoil pile up to the 8,100-foot elevation. Viewers frequently traveling on Highway *13 and Moffat County roads* 17 and 32 north of the Project Area may notice slight changes in the East Taylor temporary spoil pile as it is completed *to an elevation of 8,100 feet amsl*, but overall impacts would be the same as the current visual impacts. Transient travelers may find the visible disturbance and dust noticeable. The potential visual impacts to hunters or other recreationists in close proximity to the mine would be similar to the current impacts. Overall impacts to visual resources would continue to meet Class IV objectives.

Reclamation and Permanent Visual Impacts

During the reclamation process, the temporary spoil pile material would be used to backfill the pit over a several year period. Over that time, the temporary spoil piles would be gradually reduced and existing impacts to visual resources from the visibility of the temporary spoil piles would gradually reduce to the point that the remaining valley fill would be visible in the landscape but less so than the temporary spoil piles. Frequent travelers on the *routes* that are accustomed to seeing the temporary spoil piles may notice the change in the landscape and it may attract attention, as would ongoing dust generated by ground-disturbing activities. Transient travelers may find the visible disturbance and dust noticeable. Upon completion of reclamation, hunters or recreationists in close proximity to the reclaimed mine would continue to see obvious and noticeable disturbance to visual resources, despite the fact that post-mine topography would be reduced back to pre-mining landscape elevation and the area would be revegetated. However, the overall impact to visual resources would be minimal and meet Class IV objectives.

4.13.3 No Action Alternative

Under the No Action Alternative, mining would cease and closure and reclamation would be initiated. No additional disturbance beyond the existing disturbance footprint would occur. Impacts from reclamation would be the same as described for Alternatives A and B.

4.13.4 Mitigation Measures

No mitigation measures would be necessary for visual resources.

4.14 RECREATION

4.14.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Camping, OHV use, touring, bird watching, hiking, and other recreational pursuits would not be allowed on the Project Area due to safety concerns and conflicts with mining operations. Under Alternative A, hunting opportunities would decrease due to the increase in new surface disturbance of approximately *1,181* acres within the Project Area. However, hunting in these areas has already been discontinued for the safety of the employees and recreationists due to proximity to mining operations; therefore, this impact would be minor. Additionally, hunting success in areas adjacent to the Project Area may decrease in the short term as big game animals are displaced. This impact would likely be negligible as big game animals have become accustomed to existing mining activities and re-enter areas readily once mining and reclamation activities are complete (Colowyo 2011). At the end of the Project, the disturbance area would be reclaimed to the approved post-mining topography. Recreation would be allowed on public lands within the Project Area, but private land would remain closed to the public.

4.14.2 Alternative B – PR02 as Revised

4.14.2.1 Previous Impacts

Recreation and hunting access was closed within the Project Area in 2007. However, big game animals have likely been displaced into adjacent lands that are available for hunting (**Section 4.8**).

4.14.2.2 Potential Impacts

Under Alternative B, hunting opportunities would decrease slightly due to the increase in disturbance of approximately 20 additional acres within the Project Area. These impacts would be similar to those described under Alternative A. At the end of the Project, the disturbance area would be reclaimed to the approved post-mining topography. Recreation would be allowed on public lands within the Project Area, but private land would remain closed to the public

4.14.3 No Action Alternative

Under the No Action Alternative, mining would cease and closure and reclamation would be initiated. No additional disturbance beyond the existing disturbance footprint would occur. At the end of the Project, the disturbance area would be reclaimed to approved post-mining topography. Recreation would be allowed on public lands within the Project Area, but private land would remain closed to the public

4.14.4 Mitigation Measures

No mitigation measures would be necessary for recreation.

4.15 PALEONTOLOGY

4.15.1 Alternative A – Proposed Action, PR02 as Approved in 2007

As the Project Area lies within a PFYC Class 5 zone, there is the potential that the ground disturbing activities would adversely affect fossils. If any such fossils of paleontological interest are located in the Project Area, ground disturbing and overburden removal activities could damage the fossils and the information that could have been gained from them would be lost. The significance of this impact would depend upon the significance of the fossil. Alternative A could also constitute a beneficial impact to paleontological resources by increasing the chances for discovery of scientifically significant fossils. No significant or unique paleontological resources have been recorded within the Project Area. Surface coal mining and related activities could have a permanent impact on paleontological resources beneath the surface, assuming such resources are present. Paleontological resources not identified and transported prior to or during mining operations would be permanently lost.

4.15.2 Alternative B – PR02 as Revised

4.15.2.1 Previous Impacts

No paleontological finds have been encountered in the Project Area during mining operations to date (T. Tennyson, personal communication, June 9, 2015).

4.15.2.2 Potential Impacts

Under Alternative B, an additional 20 acres would be disturbed. The impacts would be similar to Alternative A.

4.15.3 No Action Alternative

Under the No Action Alternative, mining would cease and closure and reclamation would be initiated. No additional subsurface disturbance beyond the existing disturbance footprint would occur. Therefore, there would be no additional impacts to paleontological resources.

4.15.4 Mitigation Measures

If paleontological resources are discovered during mining operations on BLM managed lands, mine employees shall immediately notify the BLM and shall not disturb such discovered resources until the Field Office Manager issues specific instructions. Within five working days after notification, the Field Office Manager shall evaluate any paleontological resources discovered and shall determine whether any action may be required to protect or to preserve such discoveries.

Should paleontological resources be encountered as a result of the Project, OSMRE or the SHPO would be consulted as appropriate.

4.16 ACCESS AND TRANSPORTATION

4.16.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Existing haul road "A" (3.7 mile [6.0 km] roadway from pit area to Gossard Loadout) and haul road "B" (1.4 mile [2.3 km] roadway from State Highway 13 to haul road "A") would continue to be used as part of the South Taylor/Lower Wilson mining area. Access to the South Taylor mining area would be through the existing mining area, and, therefore, additional haul roads would not be required to be constructed.

Roads that would be constructed in the actual mining areas would constantly change as the operation progresses. The "in-pit" roads would be maintained by a motor grader and regularly wetted to minimize dust as required by the air quality permit.

Under Alternative A, there would be a minor, short-term increase in mine truck and employee traffic due to an increase in the production rate from an average of 4.5 mtpy to 5.8 or 6.0 mtpy. If the rate of production increases, the number of trains per year required to transport coal would also increase.

Colowyo would maintain the haul roads throughout the life of the mine with repairs including blading, filling of potholes, and replacement of road surface as necessary. The existing two-track Sturgeon Road would be upgraded to allow access for construction and for routine monitoring and maintenance. Other than the Sturgeon Access Road, there would be no changes to existing access roads for the South Taylor pit expansion. Following all mining activities, the road would remain in place as a private ranch road and would not be reclaimed.

4.16.2 Alternative B – PR02 as Revised

4.16.2.1 Previous Impacts

Truck haul and access routes were constructed within the Project Area as discussed in Alternative A, with one access road connecting to the mine support facilities (roadway from pit area to Gossard Loadout); this is where the employee parking lot is located.

4.16.2.2 Potential Impacts

No new access roads or haul roads would be constructed. No haul trucks would travel on public roadways outside of the mine permit boundary. Only mine pickup trucks/utility vehicles and workers' personal vehicles would travel on public roads. All coal is removed from the mine via trains.

Under Alternative B, if the current mining production rate of 2.48 mtpy would continue, and no additional personnel would be employed by the Colowyo Mine, workers at the currently active South Taylor Pit would continue until the pit is mined out. As there is no anticipated increase in personnel or vehicles used, the overall amount of traffic both within the mine boundary and on public roads outside the mine boundary would remain the same as current levels. No additional impacts to public roads are, therefore, anticipated.

Mine use of public roadways as discussed above would occur primarily when shifts change at the mine.

4.16.3 No Action Alternative

Under the No Action Alternative, mining would cease and closure and reclamation would be initiated. This would result in lower traffic along the public roads leading to the mine and decreased impacts to public safety and road maintenance.

4.16.4 Mitigation Measures

No mitigation measures would be necessary for access and transportation.

4.17 SOLID OR HAZARDOUS WASTE

4.17.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Under Alternative A, impacts to the environment from the potential release of hazardous or solid waste are not anticipated to occur. Solid or hazardous waste that may be used or created during the coal mining process would be limited to petroleum products (gasoline and diesel fuel, oil, lubricants) and ANFO used for blasting. CCRs, generated as a part of the coal combustion process, are discussed in **Sections 3.5.2** and **4.5.1**.

The potential for impacts from substances released depend on the responsible use of chemicals; a SPCC plan (Colowyo 2012b) is in place at the mine to ensure immediate containment and adequate cleanup in the event of an unintentional release. The potential for exposure to petroleum products, or hazardous or solid wastes would be low but would last for the remainder of the life of the mine. Spill kits would be located onsite which would be used in the case of accidental releases to assist in rapid clean up. Additionally, appropriate secondary containment would be used for all hazardous chemicals storage. No additional chemicals would be used under Alternative A that are not already being used at the current mining operation.

Construction sites and all facilities would be maintained in a sanitary condition at all times. *Regulated waste* materials would be disposed of promptly at an appropriate off-site waste disposal facility*, including* all discarded matter including, but not limited to, trash, garbage, refuse, oil drums, petroleum products, ashes, and equipment. *Colowyo would, as permitted under CDRMS Rule 4.11.4, dispose of non-coal wastes onsite. Colowyo would dispose of general house hold-type trash in a solid waste facility. Human waste water would be disposed of through a leach field and/or aeration ponds.*

As part of closure/reclamation, all petroleum products not necessary for closure or reclamation activities would be removed from the Project Area. Facility structures, including but not limited to concrete foundations, would be demolished in-place and covered with a minimum of six feet of suitable material. The area would be regraded to blend with the surrounding topography followed by topsoil and seeding as described in the reclamation plan. All demolition materials (e.g., culverts, fencing) related to sedimentation ponds would be placed within the ponds and covered with a minimum of six feet of suitable material or transported to the pit area during the reclamation process. Noncoal, nonhazardous solid waste is regulated under the Moffat County Special Use permit.

4.17.2 Alternative B – PR02 as Revised

4.17.2.1 Previous Impacts

There are no previous direct impacts on the Project Area related to solid or hazardous waste. CCRs are discussed in **Sections 3.5.2** and **4.5.2.1**.

4.17.2.2 Potential Impacts

The direct impacts related to solid and hazardous waste in future mining and reclamation operations would be the same as under Alternative A. CCRs are discussed in **Sections 3.5.2** and **4.5.2.2**.

4.17.3 No Action Alternative

Under the No Action Alternative, mining operations would cease. The reclamation operations would be the same as those described under Alternative A. CCRs are discussed in **Sections 3.5.2** and **4.5.3**.

4.17.4 Mitigation Measures

No mitigation measures would be necessary for solid or hazardous waste.

4.18 NOISE

4.18.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Under Alternative A, there would be a minor, short-term increase in noise from blasting activities, crushing, and vehicles due to an increase in the production rate from an average of 4.5 mtpy to 5.8 or 6.0 mtpy. This noise would occur 24 hours a day, 7 days a week. If the rate of production increases, the number of trains per year required to transport coal would increase. The increase in the number of trains would increase the duration of noise produced along the rail line. The noise levels would continue to be below MSHA noise regulations of instantaneous exposure level of 115 dBA or an 8 hour TWA of 85 dBA. Once closure begins in 2017, the noise levels would decrease but noise from reclamation activities (grading, reseeding, demolition of facilities, trucks, etc.) would continue until reclamation was completed.

While no homes occur within the Project Area, several homes are located just outside the boundary. The nearest homes occur approximately one to three miles (1.6 to 4.8 km) from the Project Area to the south and southeast. Given the topography and vegetation between the Project Area and these homes, it is likely that most noise would attenuate before reaching these residences.

4.18.2 Alternative B – PR02 as Revised

4.18.2.1 Previous Impacts

The Project Area has been affected directly by the noise from active mining operations (blasting, coal loading/conveyance, crushing, and vehicles) in the Project Area since 2008, and to a lesser extent from the Colowyo mining on adjacent land prior to 2008.

4.18.2.2 Potential Impacts

Under Alternative B, the noise currently experienced at the Project Area would continue at the same levels, but for two years longer than that under Alternative A. Similar to those under Alternative A, the noise levels would continue to be below MSHA noise regulations of instantaneous exposure level of 115 dBA or an 8 hour TWA of 85 dBA.

4.18.3 No Action Alternative

Under the No Action Alternative, mining in the Project Area would cease and closure and reclamation activities would begin. The level of noise would continue at closure/reclamation levels until reclamation was complete. This would occur two or four years sooner under the No Action Alternative than under Alternative A or B, respectively.

4.18.4 Mitigation Measures

No mitigation measures would be necessary for noise.

4.19 LIVESTOCK GRAZING

4.19.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Under Alternative A, Colowyo would no longer sublease the grazing rights within the Project Area to prevent conflicts between the mining operations and livestock grazing. Therefore, 0.6 to 65 percent of the AUMs in the allotments would be unavailable for grazing in the short term (**Table 4.19-1**). At the end of the life of the mine and when reclamation is successful and complete, grazing would be reinstated. Prior to any reintroduction of grazing to the area, final bond release of the disturbed area would be required. Post-reclamation grazing would be sustained at 60 percent of the carrying capacity to encourage the continued success of reclaimed vegetation. The allotments would carry <1 to 39 percent of their original grazing authorization (**Table 4.19-1**) post-reclamation. This would be a negligible to moderate, short-term impact on the availability for livestock grazing on these allotments.

Table 4.19-1 Impacts to Grazing Allotments, Alternative A

Allotment	Total AUMs[1]	# of AUMs Reduced	AUMs Remaining	Percent AUM Reduction	Post-reclamation AUMs[1]	% of Allotment AUMs Available Post-Reclamation
Taylor Creek	170/43	111/28	59/15	65	67/17	39
East Fork Wilson Creek	170/43	63/16	107/27	37	38/10	22
Smith-Crawford	1,219/0	9/0	1,210/0	0.7	5/0	0.4
Colowyo Commons	347/173	2/1	345/172	0.6	1/0	0.3
Lower Taylor Creek	27/0	3/0	24/0	11	2/0	7
Totals	1,933/259	188/45	1,745/214		113/27	

[1] Data are shown as number of cattle/sheep.

4.19.2 Alternative B – PR02 as Revised

4.19.2.1 Previous Impacts

Grazing was removed from the Project Area in 2007. The changes to available grazing were the same as identified for Alternative A (**Table 4.19-1**).

4.19.2.2 Potential Impacts

Under Alternative B, the entire Project Area would continue to be closed to grazing until it was reinstated after final bond release of the disturbed area. The impacts on livestock and grazing would be the same as those under Alternative A, but grazing would be reinstated 2 years later than under Alternative A.

4.19.3 No Action Alternative

Under the No Action Alternative, Colowyo would cease the mining operations and closure activities would begin. Grazing would be reinstated after final bond release of the disturbed area. The same effects to livestock grazing would occur as under Alternatives A and B, but resumption of grazing would occur sooner.

4.19.4 Mitigation Measures

No mitigation measures would be necessary for livestock.

4.20 SOILS

4.20.1 Alternative A – Proposed Action, PR02 as Approved in 2007

Direct short-term impacts to soils would occur on approximately *1,181 acres (**Table 4.20-1**). Topsoil would be removed from the mining area, stockpiled, and used for future reclamation needs within the Project Area in accordance with federal and state regulations and the CDRMS permit.* Areas where topsoil would be removed include the pit, overburden stockpiles, temporary piles, a previously reclaimed area, and various small, dispersed features such as access roads and sediment ponds. Limiting factors of Project Area soils influencing reclamation suitability included certain soils that are shallow and stony, or have subsurface soils that are heavy clays with a hard columnar structure and sticky, plastic properties (Colowyo 2012a). The topsoil that would be removed would include all of the A and B horizon material, excluding these heavy clay soils. The more desirable horizons with loam and clay loam textures would provide sufficient volumes (Colowyo 2012a).

Additionally, spoil material would also be monitored to ensure its compatibility and appropriateness for use as a sublayer between reclaimed surfaces prior to topsoil replacement. As described in Volume 1 - Section 2.05.3 of Permit No. C-1981-019 (Colowyo 2012a), spoil material would be sampled at a density of one composite surface sample per five acres of regraded spoil, and analyzed for pH, electrical conductivity, and sodium adsorption ratio. The results would dictate whether or not topsoil can be placed directly on the spoil material or whether additional material needs to be added first.

There would be impacts to soil resources including erosion and fertility losses as a result of mining and reclamation activities, due to the disturbance of horizons and the process of stockpiling. However, the measures (***Table 2.2-2***, **Appendix B**) used in stockpiling and maintaining the stockpiles would reduce erosion and fertility loss, so the amount and quality of stockpiled soils are expected to be sufficient for reclamation. Salvaged topsoil would be stockpiled for later use in reclamation. Stockpiled topsoil would be placed on stable sites and protected from compaction, wind and water erosion, and contaminants. Topsoil stockpiles would also be seeded to minimize erosion. The availability of suitable topsoil and erosion control are important factors in the overall reclamation success. Topsoil removal and stockpiling may reduce attributes for plant growth such as soil microbial activity, organic matter content, fertility, and water holding capacity.

As feasible, direct haul of removed topsoil to areas ready to be reclaimed would be used instead of stockpiling, where there is opportunity to do so. This method, while still disturbing the horizons, tends to preserve more of the active biologic processes and also reduces the timeframe wherein compaction can occur, and thus results in fewer potential impacts. Additionally, this method reduces the potential for erosion losses as soil is not stockpiled.

During reclamation, topsoil would be redistributed in a manner that would maximize its ability to provide a viable seedbed. Colowyo has prepared a Topsoil Redistribution Plan (**Appendix B**) that outlines the steps to ensure this.

There would be the potential for impacts to soils from accidental spills or leaks of petroleum products and hazardous materials used during construction, mining activities, and long-term operation of the mine, but if they occurred, they would be contained, controlled, and remediated as per the spill containment plan (**Appendix B**). As per the reclamation plan and the PAP for PR02 as Approved in 2007 (Colowyo 2007), acid-forming waste is not an issue at the mine. Further, Colowyo does not plan to use spoil material for topsoil substitutes or to supplement topsoil.

Table 4.20-1 Disturbance to Soil Types, Alternative A

Soil Unit	Disturbed Acres
Campspass fine sandy loam, 12 to 25 percent slopes	15.0
Cochetopa loam, 12 to 25 percent slopes	29.9
Cochetopa loam, 25 to 65 percent slopes	37.0
Jerry-Cochetopa complex, 5 to 35 percent slopes	199.1
Lamphier-Jerry complex, 25 to 65 percent slopes	26.2
Owen Creek-Jerry-Burnette loams, 5 to 35 percent slopes	577.35
Rhone-Northwater-Lamphier loams, 3 to 50 percent slopes	99.73
Torriorthents-Rock outcrop complex, 15 to 90 percent slopes	3.38
Ustorthents, frigid-Borolls complex, 25 to 75 percent slopes	134.0
Waybe-Vandamore variant-Rock outcrop complex, 5 to 30 percent slopes	61.6
Total	1,186

Overall, these impacts would be negligible. The potential of each soil for use in reclamation would essentially retain the same as its current potential. Colowyo (2012a) has determined that it is quite possible that the overall productivity of the area to be mined could be increased. In part, this is attributed to the fact that during the topsoil removal process, the smaller amounts of poorer soils would become mixed with good soils, and currently unproductive areas may become more productive.

4.20.2 Alternative B – PR02 as Revised

4.20.2.1 Previous Impacts

Direct impacts to soils have occurred on approximately 789 acres (**Table 4.20-2**). Topsoil has been removed from the mining area and used to rehabilitate existing disturbed sites outside the Project Area, or stockpiled for future reclamation needs in accordance with federal and state regulations. Areas where topsoil has been removed include the pit, spoil stockpiles, and various small, dispersed features such as access roads and sediment ponds. Approximately 66 acres has been backfilled, graded, and topsoiled under reclamation; 54 acres of this has also been seeded for revegetation.

Table 4.20-2 Disturbance to Soil Types in the Project Area, Alternative B

Soil Unit	Previous Impacts (Acres)	Potential Impacts (Acres)
Campspass fine sandy loam, 12 to 25 percent slopes	20.82	0
Cochetopa loam, 12 to 25 percent slopes	60.07	0
Cochetopa loam, 25 to 65 percent slopes	25.37	0
Jerry-Cochetopa complex, 5 to 35 percent slopes	133.58	4.31
Lamphier-Jerry complex, 25 to 65 percent slopes	26.16	0
Owen Creek-Jerry-Burnette loams, 5 to 35 percent slopes	242.53	6.05
Rhone-Northwater-Lamphier loams, 3 to 50 percent slopes	97.81	1.69
Torriorthents-Rock outcrop complex, 15 to 90 percent slopes	1.42	0
Ustorthents, frigid-Borolls complex, 25 to 75 percent slopes	153.91	7.85
Waybe-Vandamore variant-Rock outcrop complex, 5 to 30 percent slopes	27.92	0
Total	789.59	19.90

There have been impacts to soil resources including erosion and fertility losses as a result of mining and reclamation activities, due to the disturbance of horizons and the process of stockpiling. However, the measures (**Appendix B**) used in stockpiling and maintaining the stockpiles have reduced erosion and fertility loss, so the amount and quality of stockpiled soils are expected to be sufficient for reclamation. Salvaged topsoil has been stockpiled for later use in reclamation. Stockpiled topsoil has been placed on stable sites and protected from compaction, wind and water erosion, and contaminants. Topsoil stockpiles have also been seeded to minimize erosion. The availability of suitable topsoil and erosion control are important factors in the overall reclamation success. Topsoil removal and stockpiling may reduce attributes for plant growth such as soil microbial activity, organic matter content, fertility, and water holding capacity.

There have not been any impacts to soils from accidental spills or leaks of petroleum products and hazardous materials used during construction, mining activities, and long-term operation of the mine.

4.20.2.2 Potential Impacts

Negligible, short-term direct impacts resulting from the future additional soil salvage would occur on approximately 20 acres. Should accidental spills or leaks of petroleum products and hazardous materials used during construction, mining activities, and long-term operation of the mine occur, they would be contained, controlled and remediated as per the spill containment plan (**Appendix B**). Reclamation and soil stockpiling would occur in the same manner as previous. Colowyo does not plan to use spoil material for topsoil substitutes or to supplement topsoil.

4.20.3 No Action Alternative

Under the No Action alternative, no additional new ground disturbing activities would take place and impacts would be the same as described under **Section 4.20.2.1**. Reclamation would proceed and topsoil would be redistributed on previously disturbed ground.

4.20.4 Mitigation Measures

No mitigation measures would be necessary for soils.

4.21 ALLUVIAL VALLEY FLOORS

4.21.1 Alternative A – Proposed Action, PR02 as Approved in 2007

There would not be any impacts to AVFs under Alternative A. There would be no direct encroachment in any AVF under Alternative A because none are within the area to be mined (**Section 3.21** and **Figure 3-5**). Further, continuing use of stream buffer zones (as identified along Wilson Creek, Good Spring Creek, and Taylor Creek) and sediment ponds (**Figure 3-5**) would ensure that Alternative A would not be likely to indirectly affect the character of AVFs within or near the Project Area because the hydrologic balance would be maintained and water quality would be protected (**Section 3.21**). In part, as described in **Appendix B**, stream buffer zones would be properly signed, and no stream buffer zones would be encroached upon without CDRMS approval. Further, sediment ponds would serve to protect water quality of stream flow passing through the downstream AVFs. Water monitoring programs, including those designed to document any increased salinity in Good Spring Creek as a result of the movement of leached salts from fill material to shallow alluvium, would be used to verify that worst case salt loading predictions (CDRMS 2007) are not exceeded.

Although the Project Area includes Wilson Creek, no Alternative A activities that would have the potential to affect that stream's AVF have been proposed. CDRMS (2007) stipulated that should any lands along Wilson Creek be planned for disturbance, prior to approvals Colowyo would be required to analyze in detail the Wilson Creek AVF and prepare a detailed restoration plan.

CDRMS (2007) considered the lack of direct impacts and the potential for indirect impacts when assessing Alternative A. They found that: 1) the activities would not interrupt, discontinue, or preclude farming on the AVFs; 2) that the activities would not materially damage the quality or quantity of associated groundwater or surface water systems; 3) operations would be conducted to preserve the essential hydrologic functions of AVFs in and downstream of the Project Area; and 4) all requirements of CDRMS regulations would be complied with throughout operations and reclamation.

4.21.2 Alternative B – PR02 as Revised

4.21.2.1 Previous Impacts

Although AVFs exist in the Project Area (**Section 3.21** and **Figure 3-5**), they have not been directly impacted by mining activities under PR02 as Revised, based upon an analysis of the disturbed area. Further, as per Colowyo (2007) and CDRMS (2007) no disturbance of Project Area AVFs has been approved. Further, mining has not indirectly affected the character of AVFs within or near the Project Area because the hydrologic balance has been maintained and water quality has not been materially impacted (**Section 4.5.2.1**). Essentially, the same conditions and conclusions regarding AVFs that are applicable to Alternative A are applicable to Alternative B.

4.21.2.2 Potential Impacts

There would not be any impacts to AVFs under Alternative B. Continuing use of stream buffer zones and sediment ponds would ensure that the remaining operations of the Project would not be likely to indirectly affect the character of AVFs within or near the Project Area because the hydrologic balance would be maintained and water quality would be protected. Water monitoring programs, including those designed to document any increased salinity in Good Spring Creek as a result of the movement of leached salts from fill material to shallow alluvium, would continue to verify that worst case salt loading predictions are not exceeded. The reclamation plan would be implemented so material damage to AVFs would be avoided.

4.21.3 No Action Alternative

There would not be any impacts to AVFs. Under mine closure, permit obligations such as water monitoring, runoff management, and sediment control would remain.

4.21.4 Mitigation Measures

No mitigation measures would be necessary for AVFs.

CHAPTER 5 CUMULATIVE IMPACTS

5.1 INTRODUCTION

Cumulative impacts are those impacts that result from incremental effects of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or other entity undertakes such other actions.

For most resources, the cumulative impact analysis only examines the two action alternatives (Alternatives A and B) because, for the most part, the impacts under the No Action Alternative would not differ from the action alternatives but would happen sooner. Also, the No Action Alternative in this analysis would not represent incremental impacts that can be compared to other past, present, and reasonably foreseeable actions. The two exceptions, Air and Climate Resources and Socioeconomics, are evaluated in this chapter because the No Action Alternative would be associated with incremental impacts that are unique to the action alternatives.

5.2 PAST AND PRESENT ACTIONS

Past and present actions in the general area include coal mining, power generation, ranching, recreation, and oil and gas development.

Past coal mining in the area began in 1908 with the underground Collom Mine (later renamed the Mount Streeter Mine). Underground coal mining occurred continuously in the area until 1974 when that mine closed. In 1977, Colowyo initiated its first surface mining operations at the Colowyo Coal Mine. Mining in the West Pit ceased in 2014 and the Section 16 Pit was active until 2013, but with very limited production. Active mining is currently occurring only at the South Taylor Pit. In 2014, the Colowyo Mine produced approximately 2.48 mt of coal Mines.findthedata.com 2015) and employed 220 people. Currently there are approximately 4,750 acres of past and present mining disturbance associated with the Colowyo Mine, and Colowyo owns approximately 75,570 acres of land in this area. The nearest active coal mine to the Project Area is the Trapper Mine, located approximately 16 miles (26 km) to the northeast. In 2014, the Trapper Mine produced approximately 2.3 mt of coal (Tri-State 2015b) and employed 190 people (Mines.findthedata.com 2015). Other active coal mines in the vicinity include, two underground mines, the Foidel Creek Mine (also known as the Twentymile Mine) (Routt County), *the Sage Creek Mine (Routt County)*, and the Deserado Mine (Rio Blanco County). Other active mining operations within 20 miles (32 km) of the Colowyo Mine include seven gravel pits, 22 sand and gravel operations, one limestone operation, and one sandstone pit (CDRMS 2014). In addition to these resources, there has been past uranium, oil shale, and dimension stone mining operations in the vicinity of the Project Area. Mining has the potential to affect many resources through increased disturbance, both on the surface and subsurface. Mining also increases the number of people in the area.

There are two power plants in the general vicinity of the Project Area: the Craig Generating Station and the Hayden Generating Station. The Craig Generating Station, located southwest of Craig, is operated by Tri-State; approximately 300 people work at the 1,303-megawatt plant (Tri-State 2015b). Plant construction began in 1974 with the first operating unit completed in 1979. The plant site covers 1,120 acres. Its main water source is the Yampa River with supplemental allocations from nearby reservoirs. Craig Generating Station receives its coal supply primarily from two sources: Trapper Mine, located one mile (1.6 km) south of the plant and the Colowyo Mine sited about 30 miles (48.3 km) southwest of the station. Trapper Mine delivers coal to the plant via 100-ton haul trucks from the mine site. Colowyo Mine delivers coal to the Craig Generating Station daily by train. The station also augments these two sources of coal with spot coal purchases from other mines in northwestern Colorado.

The Hayden Generating Station, located four miles (6.4 km) east of Hayden (Routt County), is a 446 megawatt plant owned and operated by Xcel Energy. Construction began in 1962 with operation of Unit 1 in 1965 and a second unit in 1976 (Xcel Energy 2015). The Hayden Generating Station receives its coal from the Peabody Coal's Twentymile Mine and occasionally the Colowyo Mine (CDPHE 2015b). Coal is delivered to the station via train (Newcomer and Pierce 2013).

Historically, the Project Area and the vicinity have been used for livestock ranching, in particular cattle and sheep. Grazing within the Project Area occurs on both private and public lands outside of mining areas. Livestock ranching can impact water resources, wetlands, and vegetation and may potentially create competition for resources with big game species. Colowyo and various other land owners manage privately owned livestock ranches and also hold BLM grazing preferences on federal lands throughout the area. For example, the Morgan Creek Ranch runs cattle and sheep and includes approximately 30,265 acres, with 25,156 acres of Colowyo deeded land and 5,109 acres of BLM land.

There is limited agricultural land in the vicinity of the Project Area. Colowyo manages 68.5 acres of wheat fields (dry-land crop) located in the extreme northeast corner of the Project Area next to the coal loadout and railroad loop. Areas of irrigated agricultural lands are located just east and northeast of the Project Area and Highway 13. Dry and irrigated agricultural activities can contribute to air pollution through generation of dust and also may impact water sources.

In addition to ranching, the area also supports wildlife including big game species. Hunting is the primary recreational activity in the area. *Adjacent to the Project, on Colowyo private land holdings, employees are allowed to hunt. No hunting is allowed in active mining areas or within the Project Area*. Outside of the Colowyo owned lands, hunting and other recreational activities are open to the general public on public lands or with the approval of private land owners. No developed recreation sites exist in the vicinity of the Project Area. Dispersed recreation generally has few impacts outside of an increased amount of noise and people to an area. Other existing developments in the vicinity of the Project Area include Highway 13 located immediately east of the mine and running from the northeast to the southwest along the eastern permit boundary. This is the main highway connecting Craig with Meeker and Rifle. Moffat County Road 51, a gravel road, traverses the Project Area from northeast to southwest roughly along the western boundary of the Project Area. In addition, Moffat County Road 32, also a gravel road, traverses roughly east to west along the northern portion of the Project Area. Various unmaintained dirt roads and two tracks also crisscross the Project Area and vicinity. Use of roads increases noise impacts due to traffic, as well as increasing dust impacts through use of gravel and dirt roads. Vehicles also present a danger to wildlife through wildlife/vehicle collisions although the sparse use of the county and smaller roads in the area would have very low mortality on wildlife. Highway 13, which is a paved high speed road, would contribute to higher levels of wildlife mortality.

The Colowyo railroad spur connects the Colowyo loadout located at the northeast corner of the Project Area to the northeast with the Union Pacific main line in Craig. Use of the spur for regular coal train traffic results in dispersed impacts on air quality from diesel engine emissions and limited impacts from coal dust. In addition, electric transmission lines of various capacities traverse the vicinity. Transmission lines pose electrocution hazards to raptors unless designed specifically to minimize such impacts. Wilson Reservoir is located approximately 8 miles (13 km) northeast of the mine along Highway 13. Water storage reservoirs impact downstream flows for fisheries and riparian vegetation.

Oil and gas operations have been occurring in the vicinity of the Project Area since the 1920s. To date, within a 20 mile (32 km) radius of the mine there are 755 well locations. Of these, 552 locations are no longer producing and are abandoned, and 131 locations are producing oil or gas. Another 14 wells have been or are in the process of being drilled and completed (COGCC 2014). Impacts from oil and gas development are similar in nature to those from mining, although usually more dispersed over a larger area than for mining operations.

5.3 REASONABLY FORESEEABLE FUTURE ACTIONS

Reasonably foreseeable future actions in the general vicinity of the Project Area include additional coal mining, continued ranching and recreational activities, and ongoing oil and gas operations.

Given that coal seams exist outside the mine boundary and in the vicinity, it is reasonable to assume that coal mining may occur in the future. This may occur either as an extension of current mining operations or in new areas. Colowyo submitted a permit application package with CDRMS for the Collom Mine (northwest of Project Area), PR03, in 2009 that would include two new pits and associated facilities with a total of about 2,090 acres of disturbance. CDRMS approved PR03 for the Collom Permit Expansion Area in May 2013. OSMRE is currently reviewing the mining plan modification for the Collom Mine project, including preparation of a NEPA document. Colowyo proposes to continue to utilize the truck/shovel, dragline, and highwall surface mining techniques it has successfully used in other parts of the mine since 1977 and is currently using in the South Taylor Pit. In March 2015, Colowyo also submitted PR04 to CDRMS which, if approved, would authorize an alternative configuration for the mining plan submitted under PR03. That alternative configuration is also being analyzed in OSMRE's NEPA document under preparation. If the Collom mining plan modification is approved, it would extend mining operations for the Colowyo mine between about 20 and 40 years, depending on the mine production rate. Also, if approved, the Collom mining operations would have an approximate 3 year overlap with mining at the South Taylor Pit (as proposed under Alternative B), as that mining would wind down and the Collom production would increase. However, the total mine production rate (combined South Taylor Pit and Collom Pit) would remain at about the current 2.5 mtpy during the transition. Produced coal would likely be supplied to the Craig power plant as well as other customers throughout the country. BLM LSFO is currently processing a federal lease modification application from Colowyo to add about 26 acres to a federal lease as part of the Collom proposal. There is no proposed mining on the lease modification proposal but the surface would be disturbed for placement of a temporary spoil pile. The lease modification is also being analyzed in the Collom NEPA document.

BLM LSFO is also processing a lease modification application from Peabody Energy to add 310 acres and about 340,000 tons of federal coal to the Foidel Creek Mine. This is an underground mine located approximately 45 miles (72 km) southeast of Craig. The mine produces from a mix of private, state and federal coal resources and in 2014 produced 7.1 million tons. If approved, the mine would not start mining this added federal coal until about 2022. The Foidel Creek Mine provides coal to the Hayden power plant, as well as other facilities throughout the country, and the coal proposed to be added to the mine production would provide about 78 days of the power plant's coal needs.

CDRMS is currently processing PR07 for the Trapper Mine that, if approved, would add approximately 775 acres to the permit boundary. PR07 only increases the permit boundary and updates the sediment control plan. The Trapper Mine has been permitted by CDRMS, through permit renewal six, to continue mining up to 2017 at a production rate of about 2.6 mtpy.

The Deserado Mine, operated by Blue Mountain Energy Company, is an underground coal mine located approximately 50.5 miles (81 km) west of the Colowyo Mine. CDRMS has no pending permit actions for this mine. BLM LSFO has no pending lease modifications or lease by applications for this mine.

The Sage Creek Mine, owned by Peabody Energy and operated by Sage Creek Mining, LLC, is another underground mine located approximately 38 miles (61 km) northeast of the Colowyo Mine near Hayden, CO. Mining began briefly at Sage Creek in May of 2012, but is suspended until market conditions improve. While CDRMS considers it to be active, the mine is not producing

Supplies of coal to the Craig and Hayden power plants from the mines described above are not exclusive contracts. The power plants would continue operating even if those mines stopped supplying them coal and would purchase coal from other suppliers. No other coal lease applications have been filed with BLM in the area, and no SMCRA permit application packages have been filed with CDRMS.

Ranching operations in the area are expected to continue at current levels for the reasonably foreseeable future. Additionally, hunting and other recreational activities are also likely to continue at current levels into the reasonably foreseeable future.

The BLM's Colorado State Office conducts quarterly competitive lease sales to sell available oil and gas lease parcels. The act of leasing does not authorize any development or use of the surface of lease lands, without further application by the lessee and approval by the BLM. Oil and gas operations are anticipated to continue in the future in the vicinity of the Project Area; however, the exploration and development of new facilities may be limited because much of the vicinity is designated GSG habitat. There are currently 24 permitted locations within a 20 mile

(32 km) radius of the mine (COGCC 2014). In 2014, 112 parcels comprising 86,423.66 acres within the LSFO were nominated for the February 2015 Competitive Oil and Gas Lease Sale (BLM 2014). In support of this, the BLM LSFO completed an EA for this oil and gas lease sale that included parcels in the vicinity of the Project Area. Some of these lease sales may result in oil and gas development. After completion of coal mining and reclamation of the current and proposed mining areas is completed, oil and gas operations may potentially begin in these areas.

5.4 CUMULATIVE IMPACTS

The following section describes potential cumulative impacts to resources in the vicinity of the Project Area from the past, present, and reasonably foreseeable future actions in conjunction with Alternatives A and B. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). The cumulative impacts analysis area (CIAA) varies by resource. It may be restricted to the immediate Project Area (e.g., for soil impacts) or an entire watershed (e.g., for water resources). For the analysis of the cumulative impacts, it is assumed that all design features and any applicable mitigation measures would be implemented.

5.4.1 Topography

The CIAA for topography is the Project Area. Additional mining at the South Taylor *Pit* under any of the alternatives would have short-term effects on topography while mining is active until successful reclamation is completed. Within the Project Area, a total of 66 acres has been reclaimed to date. General pre-mining topography would be approximated through implementation of the reclamation plan (**Appendix B**). In conjunction with other past, present, and future activities, cumulative effects on topography would be negligible as these other activities generally do not change the overall topographic features of an area and reclamation would return the land to the approved post-mining topography. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.2 Air and Climate Resources

5.4.2.1 Temporal and Geographic Scope

The CIAA for air and climate resources (approximately 4,000 square miles [12,360 km^2]) was defined using a topographic/airshed approach. An assessment was conducted to determine the reasonable airshed where cumulative impacts could occur. Boundaries were defined by topographic features. Meeker represents the southwest corner of the airshed. Heading northwest along Route 64, the western edge is defined by Sagebrush Draw, Elk Spring Ridge, and Cross Mountain. The northwest corner runs through Ninemile Basin just northwest of Godiva Rim. The boundary follows the Little Snake River northeast until approximately Shaffer's Draw. The northern boundary extends east across the Great Divide ridge, past Highway 13 and the Elkhead Mountains. Sand Mountain represents the northeast corner of the air boundary. It heads southeast to the town of Clark. The eastern edge is Steamboat Springs. Heading south through the town of Yampa and into Garfield County is the southeastern edge.

Big Ridge and Oak Ridge back to Meeker encompasses the southern boundary. **Figure 5-1** depicts the CIAA for Air and Climate Resources.

5.4.2.2 Surrounding APEN Sources

The CDPHE website provides all criteria pollutant emissions data. All APEN applicable (permitted) sources that fall within the airshed boundary were analyzed. There are 128 sources of VOCs within the airshed boundary, the most of any criteria pollutant. However NO_x contributes the most emissions at an aggregated total of 19,147 tpy, the majority of which originates from the Craig and Hayden Generating Stations. **Table 5.4-1** provides the total criteria pollutants from APEN sources within the airshed boundary on a tons per year basis. Note that as of June 21, 2015 there were no sources of lead reported to CDPHE.

Table 5.4-1 Criteria Pollutant APEN Annual Emissions

Pollutant	Total (tpy)[1]
$PM_{2.5}$	837
PM_{10}	3,462
SO_2	5,609
NO_2	19,147
CO	3,550
VOC	2,798

1. Values are current as of June 21, 2015
   http://www.colorado.gov/airquality/ss_map_wm.aspx

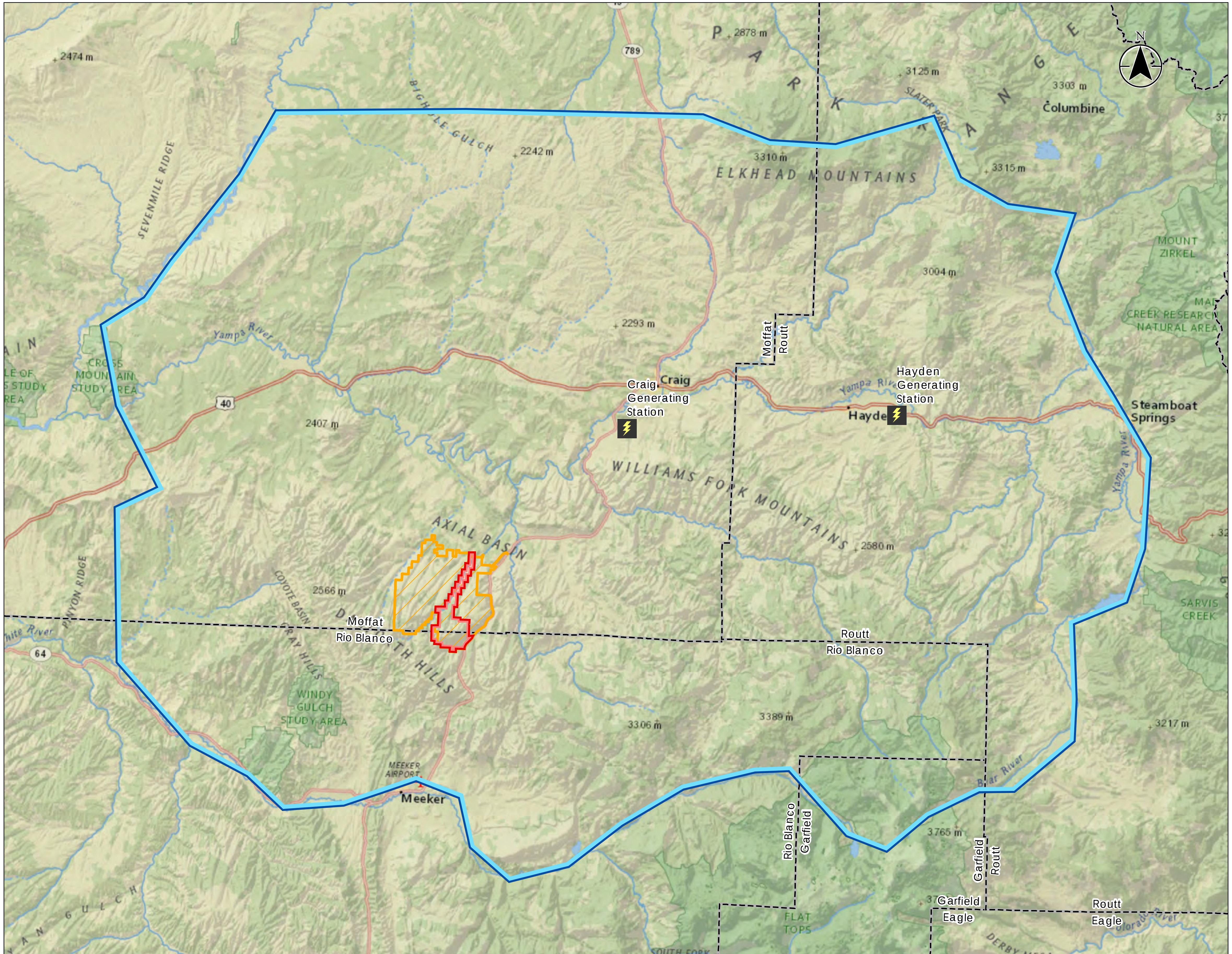
5.4.2.3 2011 National Emissions Inventory Total Regional Emissions

The 2011 EPA NEI data was used to perform a comparison analysis on all cumulative emission impacts related to Alternative A and Alternative B and **Table 5.4-2** provides the criteria pollutants by county for 2011.

Table 5.4-2 2011 Criteria Pollutants by County (tpy)[1]

County	CO	NO_x	PM_{10}[2]	$PM_{2.5}$[2]	SO_2	VOC
Garfield	25,325	16,123	4,170	1,210	187	91,075
Moffat	8,188	15,308	5,243	1,351	3,978	5,618
Rio Blanco	6,497	4,810	5,091	1,128	339	26,960
Routt	17,218	7,732	7,856	2,126	2,243	3,758
Total	**57,228**	**43,974**	**22,359**	**5,814**	**6,746**	**127,411**

1. Emissions represent all 14 Tier I Categories as defined by the EPA within the NEI database: Fuel Combustion (Electric Utility, Industrial, Other), Chemical & Allied Product Manufacturing, Metal Processing, Other Industrial Processes, Solvent Utilization, Storage and Transport, Waste Disposal and Recycling, highway vehicles, Off Highway Vehicles and miscellaneous sources.
2. Values include both filterable and condensable particulate matter



Project Area

Approved SMCRA Permit Boundary

Cumulative Effects Airshed Boundary

Generating Station

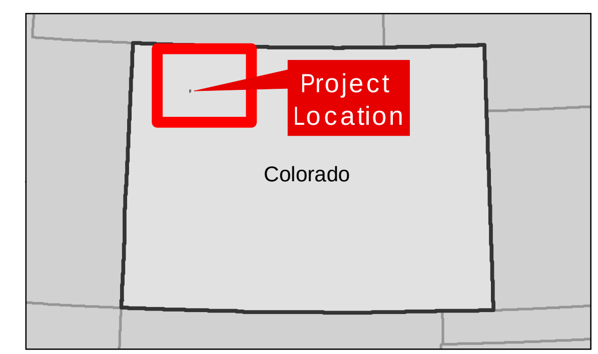
County Boundary

0 8 16 miles

1:506,880 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.



Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Colowyo Coal Mine, South Taylor/Lower Wilson Permit Expansion Area Mining Plan Modification Environmental Assessment

Figure No.

5-1

Title

Air and Climate Resources CIAA

5.4.2.4 Cumulative Emissions (Direct and Indirect)

Cumulative emissions for Alternatives A and B were determined using three regional emission scenarios. First, the maximum production was implemented to conservatively estimate annual criteria pollutants. Second, a regional average of production between the Craig Generating Station and the Hayden Generating Station was calculated to represent a typical regional emission rate. Last, because the vast majority of coal from the mine is sent to the Craig Generating Station, a Craig Only scenario was evaluated. *Alternative A shows a high percentage of gaseous pollutants, particularly* NO_x *and* SO_2*, when compared to other emission sources within the surrounding four counties. However, this is to be expected as the two generating stations contribute the vast majority of emissions within the CIAA and the maximum combustion rate is higher than what would occur in reality. Alternative B shows a moderate contribution of CO when compared to the surrounding counties. For all other pollutants, both alternatives demonstrate a negligible to moderate contribution when compared to county, state and national totals.*

<u>*Alternative A* Cumulative Criteria Pollutant Emissions</u>

The maximum annual mining rate of 6 mtpy generates both direct and indirect emissions (**Section 4.3**). Direct emissions associated with the maximum production rate remains static regardless of the regional combustion emission rates (maximum, average, or Craig Only). Cumulative criteria pollutant totals are provided in **Table 5.4-3** for each combustion rate. Average is defined as the mean value between Craig and Hayden Generating Stations. It should be noted that 6 mtpy equates to unrealistic combustion rates and the corresponding emissions are artificially conservative.

Table 5.4-3 Cumulative Emissions from Criteria Pollutants (tpy)

Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Direct Emissions	2,291	267	1,886	11,191.	72	1.3
Indirect Rail	0.10	0.10	7.0	9.0	0.27	0.03
Indirect Combustion Maximum	508	231	22,197	1,817	168	7,979
Indirect Combustion Average	381	204	20,009	1568	130	6,393
Craig Combustion Only	254	178	17,822	1,817	92	4,807
Total Maximum	**2,799**	**499**	**24,089**	**13,017**	**240**	**7,980**
Total Average	**2,672**	**472**	**21,902**	**12,768**	**202**	**6,394**
Total Craig Only	**2,545**	**446**	**19,715**	**13,017**	**164**	**4,808**

Table 5.4-4 illustrates the percentage of criteria pollutant emissions associated with Alternative A relative to the regional totals for the four counties within the CIAA as well as the entire state of Colorado. It should be noted that the proposed maximum firing rate of 6 mtpy at the *Craig* Generating Station is unrealistic in practice; hence the percentage comparison is greater than 100 percent shown below.

Table 5.4-4 Criteria Pollutants as Percentage of 2011 Regional Criteria Pollutant Emissions

Percentage Comparison	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Proposed Maximum % of 4 Counties	3.2%	50.5%	2.3%	4.0%	118%	0.13%
Proposed Average % of 4 Counties	2.7%	45.5%	1.7%	3.5%	94.8%	0.10%
Proposed Craig Only % of 4 Counties	3.2%	40.5%	1.1%	3.1%	71.3%	0.07%
Proposed Maximum % of Colorado	0.92%	7.9%	0.85%	0.49%	14.3%	0.04%
Proposed Average % of Colorado	0.90%	7.2%	0.81%	0.46%	11.5%	0.04%
Proposed Craig Only % of Colorado	0.92%	6.5%	0.77%	0.44%	8.6%	0.03%

Alternative A Cumulative GHG Emissions

Climate change by nature is a cumulative process; the discussion of direct and indirect emissions relative to the current global GHG emissions rates and the projected impacts provided above is for all practical purposes the same one that would be provided here, and therefore does not bear repeating. However, it is worth noting that sea level rise and ocean acidification (while not a regional concern) are a major cumulative concern that the Proposed Action would contribute toward, albeit insignificantly.

The values detailed in **Table 5.4-5** represent the total GHG emissions impacts from the combustion of all coal under Alternative A along with all direct mine-related activities. The worst case annual emissions assume that all mined coal (at the 6 mtpy maximum mining rate) is combusted in one year. Note that the calculation methodology for railroad engine emissions uses only a representative CO_2e factor; thus the individual component emissions are already calculated within the factor. Also, only methane is emitted from the physical extraction of coal and its subsequent handling.

Table 5.4-5 Cumulative Emissions from Greenhouse Gases (metric tonnes/yr)

Activity	CO_2	CH_4	N_2O	CO_2e
Direct Combustion	237,813	9.28	5.46	239,673
Indirect Rail Combustion	--	--	--	3,284
Methane Release	0	3,326	0	83,149
Indirect Combustion	13,952,822	1,645	239	14,065,277
Total	**14,190,635**	**4,980-**	**-244**	**14,387,837**

Table 5.4-6 compares the potential GHG emissions from 6 million tpy to state-wide totals and national totals from the 2011 NEI database and the 2014 Colorado Greenhouse Gas Inventory Update.

Table 5.4-6 GHG Emissions as Percentage of State and National Emissions (mmt/yr)

Comparison	CO_2e
Total GHG for State of Colorado[1]	130
Nationwide GHG Total[2]	2,245
% of State Total	11.1%
% of United States Total	0.64%

[1]CDPHE Colorado Greenhouse Gas Inventory -2014 Update (https://www.colorado.gov/pacific/sites/default/files/AP-COGHGInventory2014Update.pdf)
[2] Derived from all 60 sectors of the 2011 NEI database and all 50 states plus the District of Columbia. Puerto Rico, Virgin Islands and Tribal land was excluded.

Alternative A Cumulative Hazardous Pollutant and Mercury Emissions

Cumulative hazardous pollutants are a summation of those pollutants emitted by the combustion process of coal and the combustion of diesel fuel from equipment at the mine site or transferring coal to the Craig Generating Station. Similar to GHG and criteria pollutants, indirect HAP emissions were determined for a maximum, average, and Craig Only regional scenario as shown in **Table 5.4-7**.

Table 5.4-7 Cumulative Emissions of Hazardous Air Pollutants (tpy)

Activity	HAPs
Direct Emissions	9.17
Indirect Rail	0.02
Indirect Combustion Max	77.02
Indirect Combustion Avg.	64.32
Craig Combustion Only	77.02
Total Maximum	**86.2**
Total Average	**73.5**
Total Craig Only	**86.2**

The state of Colorado had a total of 195,455 tons of HAPs in 2011 as indicated by the NEI data. Nationwide, 9.05 mt were emitted. **Table 5.4-8** compares the Alternative A HAP potential to the state and national totals as a percentage.

Table 5.4-8 HAP Emissions as Percentage of State and National Emissions

Percentage Comparison	HAPs
Proposed Maximum % of Colorado	0.044%
Proposed Average % of Colorado	0.038%
Proposed Craig Only % of Colorado	0.044%
Proposed Maximum % of U.S.	0.00095%
Proposed Average % of U.S.	0.00081%
Proposed Craig Only % of U.S.	0.00095%

Estimated mercury emission rates from the Craig Generating Station are calculated based on 6 mt of coal per year combusted. The MATS Rule was published in 2011 and sources had 3 or 4 years to comply with the new standards. Therefore, Craig Station will comply with the new standard in 2015. Prior to compliance with the MATS rule indirect mercury emissions were estimated at 155 lb./yr, but after implementation of controls it drops to 62 lb./yr. Other sources of mercury are negligible (less than 0.01 lb/yr) when compared to the Craig Generating Station The 2011 NEI information for electric generating coal facilities in Colorado indicates that 745.8 lb. (0.37 tons) of mercury were emitted from coal facilities. The Craig Generating Station's contribution assuming 6 mtpy is approximately 8.4 percent of the total to the state. Nationally, the total is 25.6 tons. The Craig Generating Station is approximately 0.12 percent.

Alternative B Criteria Pollutant Cumulative Emissions

Alternative B comprises actual emissions for the mine, Craig Generating Station and the Hayden Generating Station from 2007 through 2014 and a maximum foreseeable combustion rate of 4 mtpy. **Tables 5.4-9** through **5.4-26** outline the cumulative criteria pollutant emissions for each year using a maximum average and Craig Only regional emission rate for coal combustion. The maximum represents the higher rate between the Craig Generating Station and the Hayden Generating Station. All direct emissions are associated with actual APEN submitted data or actual throughput values. Comparison tables are also provided for each year and the maximum foreseeable throughput rate of 4 mtpy. Emissions from the surrounding four counties within the CIAA and the state in its entirety are compared against the Project-related values.

Table 5.4-9 Cumulative Emissions of Criteria Pollutants - 2007 (tpy) [1]

Year	Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
2007	Direct Emissions	924	226	885	5,279	12.7	0.7
	Indirect Combustion Max	3.17	1.44	138.65	11.35	1.05	49.84
	Indirect Combustion Avg.	2.38	1.28	124.99	9.79	39.93	0.81
	Indirect Craig Combustion	1.59	1.11	111.32	11.35	0.57	30.02
	Total Maximum	**927**	**228**	**1,023**	**5,291**	**14**	**51**
	Total Average	**927**	**228**	**1,010**	**5,289**	**53**	**41**
	Total Craig Only	**926**	**227**	**996**	**5,291**	**13**	**31**

[1] The South Taylor pit was approved in 2007 and coal extraction began late in October of that year. Therefore, the amount of coal combusted at Craig that originated from South Taylor was only approximately 37,000 tons, which considerably less than all subsequent years.

Table 5.4-10 2007 Criteria Pollutants as Percentage of 2011 Regional Criteria Pollutant Emissions

Percentage Comparison	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Proposed Maximum % of 4 Counties	4.15%	3.92%	2.33%	6.25%	0.01%	0.76%
Proposed Average % of 4 Counties	4.15%	3.92%	2.30%	6.24%	0.04%	0.61%
Proposed Craig Only % of 4 Counties	4.14%	3.90%	2.26%	6.25%	0.01%	0.46%
Proposed Maximum % of Colorado	0.28%	0.22%	0.34%	0.37%	0.003%	0.09%
Proposed Average % of Colorado	0.28%	0.22%	0.33%	0.37%	0.010%	0.07%
Proposed Craig Only % of Colorado	0.28%	0.22%	0.33%	0.37%	0.002%	0.06%

Table 5.4-11 Cumulative Emissions of Criteria Pollutants - 2008 (tpy)

Year	Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
2008	Direct Emissions	924	226	885	5,279	12.7	0.7
	Indirect Combustion Max	99.93	45.51	4,370	358	33.16	1,571
	Indirect Combustion Avg.	74.95	40.32	3939	309	25.6	1,259
	Indirect Craig Combustion	49.98	35.13	3,509	358	18.05	946
	Total Maximum	**1,024**	**272**	**5,254**	**5,637**	**46**	**1,572**
	Total Average	**999**	**267**	**4,824**	**5,588**	**38**	**1,259**
	Total Craig Only	**974**	**261**	**4,393**	**5,637**	**31**	**947**

Table 5.4-12 2008 Criteria Pollutants as Percentage of 2011 Regional Criteria Pollutant Emissions

Percentage Comparison	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Proposed Maximum % of 4 Counties	4.58%	4.68%	12.0%	9.85%	0.04%	23.3%
Proposed Average % of 4 Counties	4.47%	4.59%	11.0%	9.76%	0.03%	18.7%
Proposed Craig Only % of 4 Counties	4.36%	4.49%	10.0%	9.85%	0.02%	14.0%
Proposed Maximum % of Colorado	0.31%	0.27%	1.73%	0.40%	0.008%	2.82%
Proposed Average % of Colorado	0.30%	0.26%	1.59%	0.40%	0.007%	2.26%
Proposed Craig Only % of Colorado	0.30%	0.26%	1.44%	0.40%	0.006%	1.70%

Table 5.4-13 Cumulative Emissions of Criteria Pollutants - 2009 (tpy)

Year	Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
2009	Direct Emissions	1,015	253	929	5,617	9.6	0.7
	Indirect Combustion Max	111.1	50.59	4,858	398	36.87	1,746
	Indirect Combustion Avg.	83.33	44.83	4,380	343	28.47	1,400
	Indirect Craig Combustion	55.56	39.06	3,901	398	20.06	1,052
	Total Maximum	**1,126**	**304**	**5,787**	**6,015**	**46**	**1,747**
	Total Average	**1,098**	**298**	**5,309**	**5,960**	**38**	**1,400**
	Total Craig Only	**1,071**	**292**	**4,830**	**6,015**	**30**	**1,053**

Table 5.4-14 2009 Criteria Pollutants as Percentage of 2011 Regional Criteria Pollutant Emissions

Percentage Comparison	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Proposed Maximum % of 4 Counties	5.04%	5.23%	13.2%	10.5%	0.04%	25.9%
Proposed Average % of 4 Counties	4.91%	5.13%	12.1%	10.4%	0.03%	20.8%
Proposed Craig Only % of 4 Counties	4.79%	5.02%	10.5%	10.5%	0.02%	15.6%
Proposed Maximum % of Colorado	0.34%	0.30%	1.90%	0.43%	0.008%	3.14%
Proposed Average % of Colorado	0.33%	0.29%	1.75%	0.42%	0.007%	2.51%
Proposed Craig Only % of Colorado	0.33%	0.29%	1.59%	0.43%	0.005%	1.89%

Table 5.4-15 Cumulative Emissions of Criteria Pollutants - 2010 (tpy)

Year	Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
2010	Direct Emissions	1,015	253	732	4,416	7.2	0.6
	Indirect Combustion Max	119	54.1	5,195	425	39.42	1,867
	Indirect Combustion Avg.	89.1	47.93	4,683	367	30.44	1,496
	Indirect Craig Combustion	59.41	41.77	4,171	425	21.45	1,125
	Total Maximum	**1,134**	**307**	**5,926**	**4,841**	**47**	**1,868**
	Total Average	**1,104**	**301**	**5,415**	**4,783**	**38**	**1,497**
	Total Craig Only	**1,074**	**295**	**4,903**	**4,841**	**29**	**1,126**

Table 5.4-16 2010 Criteria Pollutants as Percentage of 2011 Regional Criteria Pollutant Emissions

Percentage Comparison	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Proposed Maximum % of 4 Counties	5.07%	5.28%	13.5%	8.46%	0.04%	27.7%
Proposed Average % of 4 Counties	4.94%	5.18%	12.3%	8.36%	0.03%	22.2%
Proposed Craig Only % of 4 Counties	4.80%	5.07%	11.2%	8.46%	0.02%	16.7%
Proposed Maximum % of Colorado	0.34%	0.30%	1.95%	0.34%	0.008%	3.35%
Proposed Average % of Colorado	0.34%	0.30%	1.78%	0.34%	0.007%	2.69%
Proposed Craig Only % of Colorado	0.33%	0.29%	1.61%	0.34%	0.005%	2.02%

Table 5.4-17 Cumulative Emissions of Criteria Pollutants - 2011 (tpy)

Year	Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
2011	Direct Emissions	1,015	253	706	4,267	7.0	0.6
	Indirect Combustion Max	155.	70.78	6797	556	51.57	2443
	Indirect Combustion Avg.	117	62.71	6127	480	39.82	1,958
	Indirect Craig Combustion	77.73	54.65	5,457	556	28.07	1,471
	Total Maximum	**1,171**	**324**	**7,503**	**4,823**	**59**	**2,444**
	Total Average	**1,132**	**316**	**6,833**	**4,747**	**47**	**1,958**
	Total Craig Only	**1,093**	**308**	**6,163**	**4,823**	**35**	**1,472**

Table 5.4-18 2011 Criteria Pollutants as Percentage of 2011 Regional Criteria Pollutant Emissions

Percentage Comparison	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Proposed Maximum % of 4 Counties	5.24%	5.57%	17.1%	6.33%	0.05%	36.2%
Proposed Average % of 4 Counties	5.06%	5.44%	15.5%	8.29%	0.04%	29.0%
Proposed Craig Only % of 4 Counties	4.89%	5.30%	14.0%	8.43%	0.03%	21.8%
Proposed Maximum % of Colorado	0.36%	0.32%	2.47%	0.34%	0.011%	4.39%
Proposed Average % of Colorado	0.34%	0.31%	2.25%	0.34%	0.008%	3.51%
Proposed Craig Only % of Colorado	0.33%	0.30%	2.03%	0.34%	0.006%	2.64%

Table 5.4-19 Cumulative Emissions of Criteria Pollutants - 2012 (tpy)

Year	Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
2012	Direct Emissions	1,518	403	726	4,423	5.8	0.6
	Indirect Combustion Max	106	48.05	4,614	378	35.01	1659
	Indirect Combustion Avg.	79.14	42.57	4,159	326	27.03	1,329
	Indirect Craig Combustion	52.77	37.1	3705	378	19.05	999
	Total Maximum	**1,624**	**451**	**5,340**	**4,801**	**41**	**1,659**
	Total Average	**1,598**	**445**	**4,885**	**4,749**	**33**	**1,329**
	Total Craig Only	**1,571**	**440**	**4,430**	**4,801**	**25**	**1,000**

Table 5.4-20 2012 Criteria Pollutants as Percentage of 2011 Regional Criteria Pollutant Emissions

Percentage Comparison	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Proposed Maximum % of 4 Counties	7.26%	7.76%	12.1%	8.39%	0.03%	24.6%
Proposed Average % of 4 Counties	7.15%	7.65%	11.1%	8.30%	0.03%	19.7%
Proposed Craig Only % of 4 Counties	7.03%	7.57%	10.1%	8.39%	0.02%	14.9%
Proposed Maximum % of Colorado	0.49%	0.44%	1.76%	0.34%	0.007%	2.98%
Proposed Average % of Colorado	0.49%	0.44%	1.61%	0.34%	0.006%	2.39%
Proposed Craig Only % of Colorado	0.48%	0.43%	1.46%	0.34%	0.005%	1.79%

Table 5.4-21 Cumulative Emissions of Criteria Pollutants - 2013 (tpy)

Year	Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
2013	Direct Emissions	606	78	686	4,162	7.3	0.6
	Indirect Combustion Max	127	57.91	5,561	455	42.2	1,999
	Indirect Combustion Avg.	95.39	51.31	5,013	393	32.58	1,602
	Indirect Craig Combustion	63.6	44.71	4,465	455	22.97	1,204
	Total Maximum	**733**	**136**	**6,247**	**4,617**	**50**	**2,000**
	Total Average	**701**	**129**	**5,699**	**4,554**	**40**	**1,602**
	Total Craig Only	**669**	**123**	**5,151**	**4,617**	**30**	**1,205**

Table 5.4-22 2013 Criteria Pollutants as Percentage of 2011 Regional Criteria Pollutant Emissions

Percentage Comparison	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Proposed Maximum % of 4 Counties	3.28%	2.34%	14.2%	8.07%	0.04%	29.7%
Proposed Average % of 4 Counties	3.14%	2.22%	13.0%	7.96%	0.03%	23.8%
Proposed Craig Only % of 4 Counties	2.99%	2.12%	11.7%	8.07%	0.02%	17.9%
Proposed Maximum % of Colorado	0.22%	0.13%	2.05%	0.33%	0.009%	3.59%
Proposed Average % of Colorado	0.21%	0.13%	1.87%	0.32%	0.007%	2.88%
Proposed Craig Only % of Colorado	0.20%	0.12%	1.69%	0.33%	0.005%	2.16%

Table 5.4-23 Cumulative Emissions of Criteria Pollutants - 2014 (tpy)

Year	Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
2014	Direct Emissions	606	78	364	2,152	10.3	0.4
	Indirect Combustion Max	155	70.43	6,763	554	51.32	2,431
	Indirect Combustion Avg.	116	62.41	6,097	478	39.63	1,948
	Indirect Craig Combustion	77.35	54.38	5,431	554	27.93	1,465
	Total Maximum	**760**	**149**	**7,127**	**2,706**	**62**	**2,432**
	Total Average	**722**	**140**	**6,461**	**2,630**	**50**	**1,948**
	Total Craig Only	**683**	**132**	**5,794**	**2,706**	**38**	**1,465**

Table 5.4-24 2014 Criteria Pollutants as Percentage of 2011 Regional Criteria Pollutant Emissions

Percentage Comparison	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Proposed Maximum % of 4 Counties	3.40%	2.56%	16.2%	4.73%	0.05%	36.1%
Proposed Average % of 4 Counties	3.23%	2.41%	14.7%	4.60%	0.04%	28.8%
Proposed Craig Only % of 4 Counties	3.05%	2.27%	13.2%	4.73%	0.03%	21.7%
Proposed Maximum % of Colorado	0.23%	0.15%	2.34%	0.19%	0.011%	4.36%
Proposed Average % of Colorado	0.22%	0.14%	2.12%	0.19%	0.009%	3.50%
Proposed Craig Only % of Colorado	0.21%	0.13%	1.90%	0.19%	0.007%	2.63%

Table 5.4-25 Cumulative Emissions of Criteria Pollutants – 4 Million (tpy)

Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Direct Emissions	1,528	179	1,262	7,467	48	0.9
Indirect Combustion Max	339	154	14,798	1,211	112	5,319
Indirect Combustion Avg.	254	137	13,340	1,045	86.7	4,262
Indirect Craig Combustion	169	119	11,882	1,211	61.11	3,205
Total Maximum	**1,866**	**332**	**16,059**	**8,678**	**160**	**5,320**
Total Average	**1,781**	**315**	**14,601**	**8,512**	**135**	**4,263**
Total Craig Only	**1,697**	**297**	**13,143**	**8,678**	**109**	**3,205**

Table 5.4-26 4 Million Throughput Criteria Pollutants as Percentage of 2011 Regional Criteria Pollutant Emissions

Percentage Comparison	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Proposed Maximum % of 4 Counties	8.35%	5.71%	36.5%	15.2%	0.13%	78.9%
Proposed Average % of 4 Counties	7.97%	5.42%	33.2%	14.9%	0.11%	63.2%
Proposed Craig Only % of 4 Counties	7.59%	5.11%	30.0%	15.2%	0.09%	47.5%
Proposed Maximum % of Colorado	0.57%	0.33%	5.28%	0.61%	0.029%	9.55%
Proposed Average % of Colorado	0.54%	0.31%	4.80%	0.60%	0.024%	7.65%
Proposed Craig Only % of Colorado	0.52%	0.29%	4.32%	0.61%	0.020%	5.75%

CO, NO_x, and SO_2 emissions are higher than all other criteria pollutants for all scenarios, both actual emissions and the foreseeable future maximum throughput of 4 mtpy. This is expected because the indirect combustion emissions dominate the cumulative impacts. The percentage contribution of Alternative B compared to the counties surrounding the study area produce a maximum of 17.1 percent of the NO_x emissions; 10.5 percent of CO emissions, and 36.2

percent of SO_2 emissions. Compared to the state, those percentages reduce to 2.47 percent, 0.43 percent, and 4.36 percent, respectively. An annual throughput of 4 mtpy is greater than the actual emissions generating a higher overall percentage of regional totals. Under this scenario, the Project may produce up to 78.9 percent of the CIAA's SO_2 emissions and 9.6 percent of the state emissions. NO_x and CO contributions are also greater at 36.5 percent and 15.2 percent for the *four* surrounding counties (5.3% and 0.61% for the state).

Alternative B Cumulative GHG Emissions

All GHG emission calculations (**Tables 5.4-27** through **5.4-30**) are based on actual annual mining rates, that all coal was sent to the Craig Generating Station, and a foreseeable maximum future rate of 4 mtpy.

Table 5.4-27 Cumulative Emissions of Greenhouse Gases (metric tonnes CO_2e/yr)

Activity	2007	2008	2009	2010	2011	2012	2013	2014
Direct	76,039	74,573	68,520	52,807	50,806	48,906	53,720	44,801
Methane Release	758	2,746	2,001	1,439	1,320	1,173	1,280	1,376
Indirect Combustion	87,856	2,769,047	3,078,624	3,291,805	4,306,778	2,923,710	3,523,935	4,285,814
Total	**164,653**	**2,846,365**	**3,149,145**	**3,346,051**	**4,358,904**	**2,973,789**	**3,578,935**	**4,331,990**

Table 5.4-28 Cumulative Emissions of Greenhouse Gases (metric tonnes CO2e/yr)

Activity	4 mtpy (2015-2019)[1]
Direct	159,782
Methane Release	61,104
Indirect Combustion	9,376,851
Total	**9,597,737**

[1] 4 mtpy is the maximum annual rate at which coal is mined and combusted between 2015 and 2019.

Table 5.4-29 GHG Emissions as Percentage of State and National Emissions 2007-2014

Activity	2007	2008	2009	2010	2011	2012	2013	2014
% of State Total	0.13%	2.19%	2.42%	2.57%	3.35%	2.29%	2.75%	3.33%
% of U.S. Total	0.01%	0.13%	0.14%	0.15%	0.19%	0.13%	0.16%	0.19%

Table 5.4-30 GHG Emissions as Percentage of State and National Emissions (4 mt)

Activity	4 mtpy
% of State Total	7.38%
% of U.S. Total	0.43%

Alternative B would contribute a small percentage of overall GHGs to the region and state. Maximums are no greater than 3.4 percent from 2007 to 2014. The foreseeable 4 mtpy is also low at 7.4 percent within the state and less than 1 percent of the total GHGs emitted nationwide.

Alternative B Hazardous Pollutants and Mercury Cumulative Emissions

Cumulative hazardous pollutants are a summation of those pollutants emitted by the combustion process of coal and the combustion of diesel fuel from equipment at the mine site or transferring coal to Craig Generating Station. Similar to GHG and criteria pollutants, indirect HAP emissions were determined for a maximum, average and Craig Only regional scenario (**Table 5.4-31**).

Table 5.4-31 Cumulative Emissions of Hazardous Air Pollutants (tpy)

Activity	2007	2008	2009	2010	2011	2012	2013	2014	4 mtpy
Direct Emissions	1.3	1.3	1.0	0.7	0.7	0.6	0.8	1.0	6.1
Indirect Maximum	0.5	15.2	16.9	18.0	23.6	16.0	19.3	23.5	51.4
Indirect Average	0.4	12.7	14.1	15.1	19.7	13.4	16.1	19.6	42.9
Indirect Craig Only	0.5	15.2	16.9	18.0	23.6	16.0	19.3	23.5	51.4
Total Maximum	**1.8**	**16.5**	**17.8**	**18.8**	**24.3**	**16.6**	**20.1**	**24.5**	**57.5**
Total Average	**1.7**	**14.0**	**15.1**	**15.8**	**20.4**	**14.0**	**16.9**	**20.6**	**49.0**
Total Craig Only	**1.8**	**16.5**	**17.8**	**18.8**	**24.3**	**16.6**	**20.1**	**24.5**	**57.5**

Compared to the state (195,455 tpy), Alternative B for the years of 2007 to 2014 includes only a maximum of 0.013 percent of the state HAPs and 0.00027 percent of the U.S.'s total. A foreseeable maximum throughput of 4 mtpy equates to 0.029 percent and 0.00064 percent, respectively. Therefore, Alternative B would emit an essentially negligible amount of HAPs when compared to the state and the rest of the country.

Actual mercury emission rates from the Craig Generating Station, as provided by the EPA TRI, show that the maximum mercury emitted between 2007 and 2014 for the entire Craig Generating Station was 130 lbs or 0.065 tpy (prior to the installation of controls). The plant will become compliant with the MATS rule in 2015. As a result, the amount has dropped to the annual average of 44 lbs or 0.022 tons/year since 2010. 2013 TRI data showed that 1,070 lbs (0.535 tons) of mercury were emitted within the state of Colorado. The Craig Generating Station contributes 4.02 percent of the total mercury emitted by facilities within Colorado. Similarly, the 2011 NEI information for electric generating coal facilities in Colorado indicates that 745.8 lbs (0.37 tons) of mercury were emitted from coal facilities. The Craig Generating Station's average contribution since 2010 is approximately 5.9 percent of the total to the state. Nationally, the total is 25.6 tons. The Craig Generating Station is approximately 0.09 percent.

<u>Ozone Precursor Emissions</u>

*Discussion throughout Chapter 4 describes both NOx and VOC emissions and their comparison to the development of ozone. In addition, regional CDPHE monitors demonstrate that ozone NAAQS compliance is consistent for the past several years (**Section 4.3.2.4**). As a result, blasting and coal combustion associated with Colowyo mine and either the Hayden or Craig Generating Station does not pose a regional compliance issue.*

5.4.2.5 Colorado Air Resource Management Modeling Study

The BLM funded the Colorado Air Resources Management Modeling Study (CARMMS) to better predict air quality impacts from future federal and non-federal energy development throughout the state. The study tracks impacts in each BLM field office to better understand the significance that oil and gas has had on impacted resources and populations.[1]

CARMMS simulates future impacts of oil and gas development out to the year 2021. Projections for development are based on either the most recent field office Reasonably Foreseeable Development (RFD) document (high), or by projecting the current 5 year average development paces forward to 2021 (low). The medium scenario included the same well count projections as the high, but assumed restricted emissions, where the high assumed current development practices and on the books emissions controls and regulations (2012).[2]

The CARMMS project leverages the work completed by the West Jump Air Quality Modeling Study (WestJumpAQMS), and the base model platform (and associated model performance metrics) and meteorology are based on those products (2008).

The model (CAMx) is a one atmosphere photo-chemical grid model and represents state of the science methodology for modeling atmospheric chemistry and physics. The model accounts for every emissions source in the domain (global), including all of the coal fired power plants in the regional 4 km (6.4 miles) domain. Although these sources were not tracked using source apportionment technology, their impacts are included in the results, and in general the CARMMS data shows that air quality improves in the future.

<u>Criteria Pollutant Results from CARMMS</u>

CARMMS evaluated regional air quality impacts for particulate matter, NO_2 and O_3. **Table 5.4-32** illustrates the average regional impacts compared to the applicable NAAQS. The findings suggest that the regional air quality surrounding the mine and the Craig Generating Station is compliant for those pollutants and averaging periods evaluated. All pollutants assume the 1st high average concentration. Note that all concentrations are the maximum values for each averaging period through the study timeframe of 2021.

[1] Bureau of Land Management - http://www.blm.gov/co/st/en/BLM_Information/nepa/air_quality/carmms.html
[2] Environ - CARMMS 2021 Modeling Results for the High and Medium Oil and Gas Development Scenarios http://www.blm.gov/style/medialib/blm/co/information/nepa/air_quality.Par.97516.File.dat/CAR%20MMS_Final_Report_w-appendices_012015.pdf

Table 5.4-32 Regional NAAQS Comparison from CARMMS Data

Pollutant	Averaging Period	CARMMS Average (μg/m³)	NAAQS (μg/m³)	Percent of Standard
$PM_{2.5}$	24-hr	22.19	35	63.4%
	Annual	8.84	12	73.67%
PM_{10}	24-hr	34.51	150	23.01%
NO_2	1-hr	56.41	188	30.01%
O_3[1]	8-hr	72.31	75	96.41%

1. O_3 concentrations are in units of ppb

5.4.2.6 Regional Haze, Visibility, and AQRV Improvements

In accordance with the Guidance for Setting Reasonable Progress Goals under the Regional Haze Program,[3] states are required to establish "reasonable progress goals for each Class I area. The purpose is to improve visibility on the haziest of days and present no degradation on the clearest days. The Progress Goals are incremental in nature, such that, over time the visibility will reach natural background conditions.

Part of showing progression is to determine the glidepath. A comparison of baseline conditions in terms of deciviews (dv; *a unit of visibility impairment*) to natural conditions is conducted. Next, the annual average visibility improvement needed to reach natural conditions by 2064 - 60 years. Finally, the annual average visibility is multiplied by the number of years in the first planning period. The result is the glidepath or uniform rate of progress needed to meet the goal natural conditions visibility by 2064.

Mount Zirkel Wilderness is the nearest Class I Area to the Craig and Hayden stations. A 2007 study established the glidepath starting in 2004. Based on Interagency Monitoring of Protected Visual Environments (IMPROVE) from 2001 to 2004 the 20 percent worst visibility days baseline was determined to be 10.52 dv. Natural conditions of the worst 20 percent are 6.44 dv creating an improvement need of 4.08 dv by 2064. An annual improvement of 0.068 dv is needed to meet the 2064 goal. The first planning period was set from 2004-2018. Therefore, the visibility goal by 2018 is 9.57 dv or a visibility increase of 0.95 dv.[4]

Flat Tops Wilderness falls within the CIAA. Using the same methodology as for Mount Zirkel, a baseline and natural conditions visibility was established using 2000 to 2004 IMPROVE data. Natural conditions are 6.54 dv, while baseline visibility is 9.61 dv. Over the span of 14 years during the first planning period, the visibility is projected to improve by 0.72 dv or 0.051dv per year.[5]

The Craig Generating Station has two units that are BART eligible. All three units, 1, 2 and 3 are included in the current Regional Haze SIP. As a result, both are required to meet specific NOx standards. To help meet applicable standards, SCR units have been installed to control NOx emissions. They have also installed wet lime scrubbers for SO_2 control which have been

[3] U.S. EPA http://www.epa.gov/ttn/caaa/t1/memoranda/reasonable_progress_guid071307.pdf
[4] Colorado SIP Mount Zirkel Technical Support Document https://www.colorado.gov/pacific/sites/default/files/AP_PO_Mount-Zirkel-Wilderness_0.pdf
[5] https://www.colorado.gov/pacific/sites/default/files/AP_PO_Flat-Tops-Wilderness_0.pdf

operational since the end of 2004. According to modeling prepared as part of the BART analysis, NO_x controls will improve visibility by 1.01 dv for Unit 1 and 0.98 dv for Unit 2. Unit 3 is considered to be eligible for "Reasonable Progress"[6]. The Colorado SIP includes a determination for Unit 3 stating that it is reasonable to include a Selective Non-Catalytic Reduction (SNCR) for NOx which will improve visibility by 0.32 dv.

Similarly, the Hayden Generating Station has two units identified as BART eligible in the SIP. Both are using lime spray dryers to control SO_2. Unit 1 improves visibility by 0.10 dv and Unit 2 by 0.21 dv. Hayden also currently controls NO_X using SCR. Visibility improvements are estimated at 1.12 dv and 0.85 dv for Units 1 and 2, respectively.

The controls being implemented by the two power stations are helping to greatly improve the visibility in the region surrounding both the Mount Zirkel Wilderness and the Flat Tops Wilderness. In addition, the U.S. Forest Service has stated their concerns regarding visibility (in a letter to CDPHE in 1993) within the wilderness, which has subsequently been resolved. Colorado is also in agreement that control measures taken by the two facilities are sufficient in resolving the Forest Service concerns.

5.4.2.7 Regional Nitrate and Sulfate Deposition

Secondary aerosols form in the atmosphere from precursors gases (e.g., sulfur dioxide, NOx, and VOCs). The secondary aerosols of interest are nitrate (NO_3-) and sulfate (SO_4^2-). Both negatively charged anions have an affinity toward ammonium creating ammonium nitrate and ammonium sulfate. All of the above secondary aerosols including ammonium compounds contribute to the formation of $PM_{2.5}$.

The U.S. Forest Service has had a monitoring site for fine aerosols with the Mount Zirkel Wilderness since July 1994. Data from that monitor is available at the IMPROVE network website operated by Colorado State University. The data are captured for 24 hours every three days. Data was evaluated between 2007 through August 2014. Estimated annual average concentrations for total $PM_{2.5}$, NO_3^-, and SO_4^{2-} were determined.

All years suggested that there were considerable more SO_4^{2-} ions in the atmosphere than nitrate. This is likely because ammonium will combine with NO_3 until it is exhausted before forming ammonium sulfate. Thus, the measure of excess nitrate remaining is highly dependent on the amount of ammonium in the atmosphere.

During 2007 to 2014, the average $PM_{2.5}$ concentration was 2.25 µg/m3, with SO_4^{2-} contributing approximately 18 percent and NO_3^- only 3.6 percent. Note that the vast majority of fine particulates in the area are comprised of organic mass and soil. Based on average aerosol data since 1994, those two components (organic mass and soil) comprise approximately 40 percent and 20 percent of total $PM_{2.5}$, respectively.

With no change in the firing rate proposed for either the Craig or Hayden Generating Stations as part of any of the alternatives, these levels of NO_3^- and SO_4^{2-} deposition are not likely to

[6] CDPHE Regional Haze SIP Craig Station https://www.colorado.gov/pacific/sites/default/files/AP_PO_Craig-Power-Plant_0.pdf

change as a result of those actions. Note that SCRs only control NO_x emissions which are a ratio of NO to NO_2. Thus there is no impact on NO_3^- regarding the presence of SCRs.

5.4.2.8 No Action Alternative Cumulative Effects

The No Action Alternative would equate to the closure of the South Taylor pit immediately. All direct mining emissions would cease. Indirect railroad emissions would be likely increase somewhat as the rail distance from another mine to the Craig Generating Station would become greater. Comparatively, direct emissions for the No Action Alternative would be less than both Alternatives A or B with all production ending immediately.

The maximum combustion rate at the Craig Generating Station over the past several years has been approximately 4.8 mtpy. In order to maintain that rate, Craig would have to obtain 2.3 mt from another mine to offset the loss of Colowyo. The No Action Alternative would have a lower overall cumulative emissions effect than Alternative A, which was discussed in detail above, but similar impacts to Alternative B. Both Alternatives A and B were shown to have no significant impact when compared to the nearby counties, state and the United States as a whole. Similarly, the No Action Alternative would create an insignificant comparative impact.

5.4.3 Geology

The CIAA for geological resources is the Project Area. The cumulative impacts from either Alternative A or Alternative B would be the continued removal of coal. Since 1977, Colowyo has mined between 0.3 and 6.4 mt of coal annually for a total of 150.9 mt of coal produced. Approximately 43 mt of coal would be mined under Alternative A or 33.1 mt of coal under Alternative B; 29 to 22 percent, respectively, of all the previously mined coal at Colowyo. Other geologic features in the area would remain in place and would not be impacted as they typically occur at greater depths than where mining would occur. Other actions that may cumulatively impact geological resources are limited to future mining (such as Colowyo's proposed Collom expansion to the northwest) and oil and gas development. However, while future mining could possibly occur within the CIAA, such mining would not occur until the Project is complete. Oil and gas drilling would not be allowed until mine reclamation is completed. Cumulative impacts from these activities would be minor to moderate as geologic resources are removed. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than minor to moderate.

5.4.4 Water Resources

The CIAA for water resources is the Wilson Creek, Taylor Creek, and Good Spring Creek watersheds. Generally, much of the area is undeveloped, but may be a source for non-point sediment sources due to geology and land use. Other land use activities in these watersheds could include existing and future coal mining operations, oil and gas exploration, and agriculture (primarily grazing). Colowyo's proposed Collom expansion would be located in the CIAA northwest of the Project Area. If authorized, coal mining would be initiated at the Collom expansion and would continue there for several decades; therefore, the CIAA would continue to be developed for coal extraction for an extended period. Oil and gas exploration within the Project Area could not go forward until mining operations and reclamation were complete.

However, oil and gas exploration could occur in other areas of the CIAA so coal mining and oil and gas development could occur concurrently within the CIAA. Oil and gas development would have potential to contribute to sedimentation and spills with potential cumulative impacts to water quality but would be minimized by their permitting requirements. Therefore, there would be no cumulative effects on water resources within the CIAA from these activities.

With respect to agriculture, grazing is expected to be an important land use within the CIAA for the foreseeable future. Grazing within the Project Area would not be conducted under either Alternative A or B prior to final reclamation in order to prevent land use conflicts and to enhance the success of revegetation. Even after reclamation is complete, grazing in the Project Area would be restricted to approximately 60 percent of the authorized use to enhance the continued success of revegetation. Therefore for an extended period of time, there would be no effects from grazing on water resources in the Project Area. However, grazing in other portions of the CIAA would have the potential to increase erosion and sedimentation with potential cumulative impacts to water quality, but would be managed by the BLM. In the long term, the effects would be minor.

In summary, given: 1) the minor impacts to water resources that have occurred as a result of mining over the past seven years; 2) the sequential nature of other potentially impacting land uses in the Project Area that would be deferred until after reclamation is complete; 3) the extended timeframe when there would be no impacts from those other activities in the Project Area; and 4) the predicted negligible to minor level of impacts predicted to occur for water resources under either Alternative A or Alternative B, only minor cumulative impacts to water resources are predicted. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Cumulative impacts under the No Action are considered less than minor.

5.4.5 Vegetation

The CIAA for vegetation is the Project Area. Additional mining under Alternative A or Alternative B would have the potential to cumulatively impact vegetation in the area. Along with the past, present, and reasonably foreseeable future actions, mining in the Project Area is likely to result in minor cumulative impacts to the region due to the disturbance and reclamation (some contemporaneous) of the area at the end of the life of the mine and re-establishment of local vegetative communities which has been ongoing. Sustainable grazing is anticipated to continue outside of the Project Area as currently practiced. Wildlife usage (including sage grouse) and vegetation communities are not likely to be adversely impacted over the long term. Reclamation activities would actually likely add seral and community diversity and increased production of forage for livestock, fish and wildlife. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action Alternative are considered negligible.

5.4.6 Wetlands

The CIAA for wetlands is the Project Area. The cumulative impacts of additional mining to wetlands would occur from the removal of the wetlands within the Project Area and potential sedimentation of downstream wetlands. Given the measures in place and approved in PR02 as

Revised to reduce the potential for downstream impacts (Appendix B), these impacts have been and would continue to be minimal. Grazing, if not properly managed, can cause the structure and water quality of those wetlands to be impacted. Oil and gas development is generally required through federal lease stipulations or permit approval conditions to remain a set distance from wetlands, and few impacts occur. Additionally, increased road construction and use has the potential for an increase of sedimentation from the roads that are not paved. This impact would be mitigated as all roads constructed in the Project Area have included and would continue to include sedimentation control measures.

The CIAA for WOTUS (excluding wetlands) is the Wilson Creek, Taylor Creek, and Good Spring Creek watersheds. As presented in **Section 4.7**, neither Alternative A nor Alternative B would result in the loss of mapped WOTUS (excluding wetlands) in these watersheds. Therefore, this would not cumulatively add to the impacts to WOTUS (excluding wetlands). Other activities that have the potential to impact WOTUS (excluding wetlands) include oil and gas development and agricultural development through the potential loss of WOTUS or an increase of sedimentation into the channels. Recreation, livestock grazing, and other "non-ground disturbing" activities are likely to add to cumulative impacts through a potential increase of sedimentation, particularly if these activities occur near WOTUS (excluding wetlands).

All activities are limited through federal regulations under Section 404 of the CWA and regulations set by the USACE. The restrictions imposed by these regulations reduce the potential for developments to remove or impact wetlands and WOTUS in the area or require wetland impacts to be mitigated. Overall, Alternatives A and B would have minor cumulative impacts to wetlands and WOTUS, since any impacted wetlands and WOTUS have been or would be subject to mitigation. If any additional wetlands are located or delineated within the Project Area, they may be subject to additional mitigation. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than minor.

5.4.7 Fish and Wildlife

The CIAA for fish and wildlife resources is the Project Area, which includes a large buffer zone around the disturbance areas.

When combined with past, present, and reasonably foreseeable future activities in the region, mining in the Project Area would cumulatively contribute to impacts to fish and wildlife species. This cumulative impact would be relatively minor given the large amount of similar undisturbed habitat that occurs in the region and because the area would be reclaimed to pre-disturbance conditions at the end of the Project.

Other activities in the region have the potential to cumulatively impact wildlife. Livestock grazing can create competition for grazing resources between cattle and big game species. The Morgan Creek Ranch is located in the vicinity of the Project Area. The Morgan Creek Ranch participates in the Ranching for Wildlife program for this area that was created in 1993 through a voluntary cooperative agreement between the landowner (Colowyo) and the CPW. This program provides Colorado residents with the opportunity to hunt on private ranch land normally closed to the public (CPW 2015b). Participating ranches provide public hunting recreation access to their land free of charge to those who draw licenses. The ranch includes approximately 30,265 acres, with 25,156 acres owned by Colowyo. Livestock grazing on the ranch is limited to mid-May through mid-October due to the local climate and a relatively short growing season. Rotational grazing has been implemented using well-maintained boundary and cross fences, along with water developments. Long-term planning for grazing management and wildlife habitat improvement continues with considerations of weather conditions and resource management. Wildlife habitat management objectives are met using a wide range of improvements including grazing management, prescribed burning, water development, and riparian restoration. Managing livestock grazing on the Morgan Creek Ranch for the mutual benefit of wildlife would reduce potential cumulative impacts on wildlife in the area resulting from grazing. Future oil and gas development would have the potential to displace wildlife species from an area for the life of those projects. However, oil and gas development on both federal and state leases is strictly regulated and subject to extensive wildlife protection mitigation measures and thus would be analyzed independently should such development occur. Dispersed recreation may disturb individual animals and result in minor and temporary displacement. Cumulative impacts from these activities would likely be negligible.

The additional surface disturbance created by either Alternative A or B would increase the potential for sedimentation to occur and therefore may potentially impact fisheries downstream of the Project Area. However, with the implementation of design features (**Section 2.*2.3*** and **Appendix B**), the potential for sedimentation impacts would be small. Therefore, the cumulative impacts to fisheries would also be negligible. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.8 Special Status Species

The CIAA for special status species is the Project Area plus a one mile (1.6 km) buffer around the disturbance area. The CIAA for the Colorado River fish species *and western yellow-billed cuckoo* extends to the Yampa River in a two mile (3.2 km) buffer surrounding the Craig Generating Station. Continued development of mining operations in the Project Area would contribute incrementally to other surface uses that occupy and adversely modify habitat for the special status species that occur.

GSG is a special status species of concern. Design features (**Section 2.*2.3*** and **Appendix B**) associated with reclamation would focus on restoration of the sagebrush steppe vegetative community for the specific benefit of GSG with a planned post-mining increase in GSG habitat when compared with the pre-mining condition (**Appendix B**, Section III). The above measures are also in addition to mitigation measures for GSG that Colowyo is required to implement under their current surface mining permit for the Colowyo mine approved by CDRMS.

Alternative A would not impact any PHMA but would directly impact 692.5 acres and indirectly impact 2,543.3 acres of GHMA. Given the combination of design features (**Section 2.*2.3*** and **Appendix B**, Section III) that would be implemented as requirements under either Alternative A or Alternative B and other reasonably foreseeable future actions, the cumulative impacts to GSG in combination with other past and present actions, would be minor to negligible.

The Colorado River fish are also of particular concern. Other activities that occur in the region would have the potential to result in water depletions including future mining at

Colowyo. However, any future *depletion(s)* would be subject to RIPRAP and would be offset through funding of the RIPRAP program.

Given the combination of BMPs and design features that would be implemented as requirements under Alternative A or B and other reasonably foreseeable actions in the CIAA, these actions would not be expected to appreciably change the current aquatic conditions in the Yampa River. Consultation with the USFWS under Section 7 of the ESA has also included several *conservation* measures designed to mitigate cumulative impacts to *the Colorado River fish species and western yellow-billed cuckoo*.

Neither action alternative would be expected to directly contribute to cumulative impacts to the Colorado River fish species *or western yellow-billed cuckoo*. However, indirect impacts from the combustion of Colowyo coal at the Craig Generating Station would continue to release mercury. Some portion of this mercury is reasonably likely to end up in the Yampa River which would cumulatively impact the Colorado River fish *and western yellow-billed cuckoo*. It is also reasonably foreseeable that combustion at the Craig Generating Station would continue to occur if coal was not supplied by Colowyo. Therefore, while mining in the Project Area would result in cumulative impacts to the Colorado River fish *and western yellow-billed cuckoo* from water depletions, mercury deposition would occur even if mining was eliminated in the Project Area (i.e., No Action Alternative) as coal would be supplied from elsewhere.

Alternative A or Alternative B, in conjunction with other past, present, and reasonably foreseeable future actions, would contribute negligible to minor long-term cumulative loss of habitat in the CIAA for Great Basin spadefoot, mountain plover, Columbian sharp-tailed grouse, burrowing owl, Brewer's sparrow, and white-tailed prairie dog until reclamation restores habitat. Further, Alternatives A or B, in conjunction with other past, present, and reasonably foreseeable future actions, would contribute negligible to minor short-term to long-term cumulative loss of foraging habitat in the CIAA for ferruginous hawk, bald eagle, American peregrine falcon, and Townsend's big-eared bat. All impacts on special status species would be negligible after successful reclamation. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.9 Cultural and Historic Resources

The CIAA for cultural resources is the Project Area, which provides a large buffer zone around the disturbance areas.

Most cultural resources tend to degrade over time due to natural processes but many survive for thousands of years. Modern human activity can exacerbate the damage that naturally occurs to cultural resources. Cumulative impacts to cultural resources can be broad and include past, present, and future activity within and adjacent to the Project Area as well as the surrounding area viewshed. The CIAA has been historically used for cattle ranching, mining, and recreational activities such as hunting. Any extant historic properties (i.e., NRHP-eligible cultural resources) within the CIAA are more likely to have sustained impacts as a result of prior ranching/grazing activities or other historic land-use activities than from mining.

Continued use and/or development of the area would have the potential to detract from the integrity of cultural resources directly through physical disturbance or indirectly through the degradation of the historical environmental setting. Increased utilization of the area also increases the potential for illegal collection or vandalism of cultural resource sites. Conversely, the development of the area would result in additional cultural resource studies. The information and data gained from these potential studies would be valuable to the overall knowledge of the area and have the potential to aid in the mitigation of unknown adverse effects.

The potential impacts of Alternatives A and B are avoided through implementing design features and mitigation measures described in **Sections 2.*2.3*** and ***4.10.4***, respectively. Similar measures would be implemented for other types of federal undertakings and would also limit cumulative impacts to cultural resources. Since no impacts to NRHP-eligible or "needs data" cultural resources have occurred or are predicted under Alternatives A or B, there would be no cumulative impacts. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Similarly, there would be no cumulative impacts under the No Action Alternative.

5.4.10 Indian Concerns

The CIAA for Indian concerns is the Project Area, which provides a large buffer zone around the disturbance areas. None of the tribes contacted indicated areas of concern. Since no impacts to Indian concerns have occurred or are predicted under Alternatives A or B, there would be no contribution to cumulative impacts to Indian concerns in the region. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. There would be no cumulative impacts under the No Action Alternative.

5.4.11 Socioeconomics

The CIAA for socioeconomics includes Moffat, Rio Blanco, and Routt counties. The individuals and businesses that would be affected by the Project would be primarily in these counties, with the cumulative effects greater for the individuals and businesses in Moffat County where the Colowyo mine is located. The social and economic structures and relationships that are in place in the CIAA in support of previous and current mining and other activity in the area are described in **Section 3.12**, in addition to the local, mine-related employment and activity. The incremental socioeconomic impacts of Alternatives A and B would include a constant level of employment and economic contribution from tax, royalty, and service revenues for the next two and four years, respectively. Cumulatively, the mining in these counties including that which occurs at the Trapper, Foidel Creek, and Deserado mines; and the reasonably foreseeable Collom expansion at the Colowyo mine; contribute to the economy and need for services in the CIAA. There is a cumulative need for housing, schools, retail, food services, and municipal services such as police, fire, etc. because of the presence of (and active mining at) all of these mines within the CIAA. Consequently, the eventual closure of these mines will have an adverse cumulative impact to these factors in the CIAA which would be more substantial depending on the timing of the cessation of mining at each facility.

Under the No Action Alternative, the socioeconomic impacts discussed in **Section 4.12** would happen two or four years earlier, respectively, than under Alternative A or B. This means that under the No Action Alternative, the economic loss would be $65 million to $131 million more than under the action alternatives, because the CIAA would not benefit from those payments during those years. Currently, the counties in the CIAA are experiencing economic impacts related to the reduction in the agricultural and ranching economies, and the potential reduction in oil and gas development due to the presence of GSG habitat (Jaffe 2015). The management of public lands under the direction of the Northwest Colorado Greater Sage Grouse LUP/FEIS (BLM 2015), may cause reductions in employment in the CIAA due to land use restrictions. Impacts in local areas could be dramatic and significant, especially in areas where mineral exploration and development, including the development of minerals other than oil and gas (e.g., coal and several salable and locatable minerals), is a sizeable contributor to employment, output, earnings, and tax revenues (BLM 2015). Therefore, the economic impacts under the No Action Alternative would have greater incremental cumulative economic impacts, and add to the economic uncertainty, within the CIAA than either action alternative when compared to the decline in other industries in the CIAA.

5.4.12 Visual Resources

The CIAA for visual resources is the Project Area and a 20 mile (32 km) buffer to account for the viewshed from the highest point in the disturbance area. While the location of the mine and ancillary facilities are topographically screened, visual disturbances associated with the mining operations are intermittently visible for travelers on the highways north of the Project Area. Combined with other ongoing surface disturbing activities within the Project Area, including the proposed Collom expansion to the Colowyo mine and sand and gravel operations (approximately 5 [8.0 km] to 8 miles [12.8 km]) north and northwest of the Project Area), mining in the Project Area cumulatively contributes to a visually impacted landscape. Under both Alternative A and B, mining would continue; mining disturbance would increase in areas intermittently visible north of the Project Area until mining is complete, and would contribute to cumulative effects to visual resources. Under either action alternative, reclamation would include recontouring and revegetating the South Taylor pit. Areas of valley fill would permanently alter area topography and would be intermittently visible in the landscape, contributing to cumulative effects. Alternative A would have potentially greater cumulative impacts as it would disturb a larger footprint than Alternative B. Residual effects of mining would be apparent for a number of years until the reclaimed area naturalizes with mature vegetation. Cumulative impacts to visual resources would be minimized due to reclamation efforts. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered negligible.

5.4.13 Recreation

The CIAA for recreation is Moffat and Rio Blanco Counties. Under either Alternative A or Alternative B, recreation, including hunting by the general public, would not be allowed to occur within the Project Area. Only mine employees or their families are currently allowed to access Colowyo-owned lands (excluding the active mining areas) during hunting season. There would not be any loss of recreational potential, on Colowyo privately owned land, because public access has never been allowed. The public parcels of land within the Project Area are closed to public access for safety reasons. The continuation of programs such as Ranching for

Wildlife that provides Colorado residents with the option to hunt on private ranch land normally closed to the public, would offer additional hunting opportunities. Recreational trends in Moffat and Rio Blanco counties would continue. Cumulative impacts to recreation would be negligible. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.14 Paleontology

The CIAA for paleontological resources is the Project Area. Mining under Alternative A or Alternative B could incrementally add to the potential impacts on paleontological resources in the Project Area. Other activities that may impact paleontological resources include future oil and gas development and additional mining. Activities such as recreational hunting that may occur within the Project Area are limited due to the fact that the Project Area is closed to the public. Future ground disturbing activities associated with mining within the Project Area would be subject to paleontological protection measures. Given the small area disturbed relative to the overall large land area of the region, as well as the limited number of surface disturbing activities other than mining that may occur on the privately held Colowyo land, cumulative impacts would be negligible. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.15 Access and Transportation

The CIAA for access and transportation includes Moffat and Rio Blanco Counties. Mining under Alternative A or Alternative B would maintain mine-related infrastructure for traffic. The tax revenue generated from mining would contribute to the maintenance of public roads in the counties. The number of mine employees and associated traffic volume would increase under Alternative A, but would not change from current levels under Alternative B due to lower annual tons of coal being mined. Under Alternative B this relatively constant mine traffic would be included in the overall traffic volume for the counties which varies somewhat seasonally due to tourism and hunting. The cumulative impacts of wear and tear on the roadways from mine traffic would be negligible in the overall context of the other sources of traffic. However, if the mine production rate rose to the maximum permitted level for several years under Alternative A, the traffic volume both inside the mine permit boundary and outside the boundary on county and state roads would likely increase. Regardless of such an increase in production, the cumulative impacts from the relatively small incremental increase in mine traffic would remain negligible. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.16 Solid and Hazardous Waste

The CIAA for solid and hazardous waste is the Project Area. There are no impacts to the environment due to solid and hazardous wastes anticipated for any of the Alternatives; therefore, there would be no cumulative impacts.

5.4.17 Noise

The CIAA for noise is the Project Area, the railroad, and residences within 0.5 mile (0.8 km) of the Project Area. The principal noise sources related to continued mining operations include blasting, vehicles, the railroad, and noise from other facilities such as for mine vehicle maintenance. While noise would generally increase within the Project Area under Alternative A due to increased production and number of trains leaving the loadout, most of the noise would attenuate before reaching the mine permit boundary. As the rate of mining would remain at current levels, there would be no changes to noise under Alternative B. The nearest residences occur approximately one to three miles (1.6 to 4.8 km) from the Project Area to the south and southeast. Given the topography and vegetation within the CIAA, most noise would attenuate before reaching these residences. In conjunction with other past, present, and reasonably foreseeable future land uses within the CIAA, the mining under Alternative A or Alternative B would result in negligible cumulative impacts to noise in the region. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.18 Livestock

The CIAA for livestock grazing includes the five grazing allotments within the permit boundary. Under both Alternative A and B there would be a short-term reduction in the availability of grazing within the project area. This would cumulatively add to impacts on livestock grazing in the affected grazing allotments by reducing available forage. Grazing is one of the post-mine land uses targeted by the reclamation plan in Colowyo's PR02 as Revised (**Appendix B**) and, upon completion of mining, the mine area would be restored for future livestock grazing at 60 percent of the authorized use. Other activities in the allotments, such as oil and gas development, would also contribute to the cumulative impacts on grazing activities; although the dispersed and time limited nature of oil and gas operations would result in negligible impacts over the long term as well. The cumulative reduction of the available forage in the allotments would be negligible to minor because grazing would again be available after reclamation. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.19 Soils

The CIAA for soils is the Project Area. Mining under either Alternative A or Alternative B would contribute to the cumulative impacts to soil resources from other surface disturbing activities such as oil and gas development. However, because oil and gas development within the CIAA would not be allowed until mining and reclamation are complete, those impacts would be negligible. Mining would likely increase erosion in impacted areas; however, the implementation of the Reclamation Plan under PR02 as Revised (**Appendix B**), as well as other design features (**Section *2.2.3***) and BMPs would reduce the likelihood of increased sedimentation outside of the Project Area. Additionally, no other surface disturbing activities would be allowed within the Project Area until post-mining reclamation of the area is complete. Therefore, the cumulative impacts on soil resources would be minor. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than minor.

5.4.20 Alluvial Valley Floors

The CIAA for AVFs is the Wilson Creek, Taylor Creek, and Good Spring Creek watersheds, which is the same as the Water Resources CIAA (**Section 5.4.4**). Agricultural activities in these watersheds could have directly affected these AVFs in the past by farming in the bottomlands; this would be a minor cumulative impact when compared with Alternatives A and B. Otherwise, ongoing and future agricultural activities are expected to be primarily grazing (**Section 5.4.4**). These, as well as past, existing, and future coal mining operations (e.g., proposed Collom expansion), and oil and gas exploration, could also indirectly affect AVFs through sedimentation, spills or releases, and flow reduction (**Section 5.4.4**). In summary, given: 1) the negligible impacts to AVFs that have occurred as a result of mining over the past seven years and the past minor impacts as a result of agriculture; 2) the sequential nature of other potentially impacting land uses in the CIAA that would be deferred until after reclamation is complete; 3) the extended timeframe when there would be no impacts from those other activities; and 4) the predicted negligible level of impacts predicted to occur for AVFs under either Alternative A or Alternative B, only negligible cumulative impacts to AVFs would occur. Mining and reclamation under the No Action Alternative would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered less than negligible.

CHAPTER 6 COORDINATION AND CONSULTATION

6.1 AGENCIES/PERSONS CONSULTED

The following people or agencies were consulted prior to and during the preparation of this EA:

- U.S. Fish and Wildlife Service (USFWS)
- Colorado Department of Public Health and Environment (CDPHE)
- Office of Archaeology and Historic Preservation, History Colorado
- Eastern Shoshone Tribal Council
- Ute Mountain Ute Tribal Council
- Ute Indian Tribal Council
- Southern Ute Tribal Council
- Rio Blanco County
- Affected Landowners

6.1.1 Public Comment Process

Public scoping comments were solicited via public outreach legal notices published in the *Rio Blanco Herald Times* and the *Craig Daily Press* on May 21 and 22, 2015, and again on June 4 and 5, 2015, respectively (**Appendix A**). The legal notice was also posted in public locations in Craig and Meeker. In addition, a public outreach notice letter (May 21, 2015) was mailed to 98 identified interested parties including BLM, Indian tribes, state agencies, city and county governments, adjacent landowners, and other interested parties. A revised outreach letter was sent out on May 27, 2015, to inform the public that the venue for the public meeting had been changed in order to accommodate larger attendance. Further, on May 28 and 29, revised legal notices were again published in the *Rio Blanco Herald Times* and the *Craig Daily Press* respectively (**Appendix A**) informing the public that the meeting location had been changed.

In order to reach a larger audience, OSMRE created the following project website:

http://www.wrcc.osmre.gov/initiatives/colowyoMineSouthTaylor.shtm

The website became live on May 21, 2015, which provided the legal notices, outreach notices letters, outreach meeting materials, mailing address, and an email address for comments to be sent. The legal notices and letters invited the public to comment on issues of concern for the Project, and informed the interested citizens of the public outreach meeting held on June 10, 2015, at the Moffat County Fairgrounds, Grandstands building, 601 Victory Way, Craig, CO, from 4:00 PM until 8:00 PM. A total of 632 people attended and 447 submitted comment forms at the meeting. A total of 521 comment forms and 662 email comments, for a total of 1,183 comment submittals, were received by the end of the comment period. Public comments were received through June 15, 2015 and included the following issues:

- General support of the project;
- NEPA compliance;
- Impacts to air quality and climate change;
- Impacts to socioeconomics if the mine were to shut down;
- The need for an EIS;
- Impacts to rare or imperiled fish, wildlife, and plants; and
- Mitigation for impacts.

All comments received have been considered in the preparation of this document. A summary discussion of the issues raised during scoping is discussed in **Section 1.6.**

OSMRE released the EA on July 27, 2015, for the public to review and comment for a 19 day period ending on August 14, 2015. Comments *were* accepted via mail and email. *A total of 9,525 comment letters or emails were received.* Revisions *were* made to the EA, *as appropriate*, and responses to comments prepared as part of the Mining Plan Decision Document. *The comment and response document is provided as **Appendix F**.*

6.1.2 US Fish and Wildlife Section 7 Process

*On August 5, 2015, OSMRE reinitiated the Section 7 consultation process with USFWS when they submitted a biological assessment (BA). The BA requested to reinitiate the consultation process due to the indirect effects of mercury and selenium deposition on listed species. A revised BA was submitted on August 25, 2015 and a BO was issued by USFWS on August 27, 2015 (**Appendix D**).*

6.1.3 Tribal Consultation

On June 16, 2015, OSMRE sent a letter to each of the tribes explaining the project and requesting consultation under Section 106 of the National Historic Preservation Act of 1966 (as amended), and none of the Tribes responded. On July 15, 2015, OSMRE sent a letter to each of the tribes explaining that the EA and FONSI would be available for review and comment July 27, 2015, through August 14, 2015.

6.2 COOPERATING AGENCIES

The following is a list of Cooperating Agencies for the preparation of this EA:

- Bureau of Land Management (BLM)
- Colorado Department of Natural Resources (DNR), including the Executive Director's Office, Colorado Division of Reclamation Mining and Safety (CDRMS), Colorado Division of Parks and Wildlife (CPW), and Colorado State Land Board (SLB)
- Moffat County

Table 6.2-1 lists the participants in the preparation of this EA from the Cooperating Agencies.

Table 6.2-1 Participants from Cooperating Agencies

Name	Title
Tim Wilson, BLM	Assistant Field Manager, Little Snake Field Office
Kathy McKinstry, BLM	Planning and Environmental Coordinator, Little Snake Field Office
Jennifer Maiolo, BLM	Mining Engineer, Little Snake Field Office
Desa Ausmus, BLM	Wildlife Biologist, Little Snake Field Office
Chad Meister, BLM	Natural Resource Specialist (Air Quality), Colorado State Office
Kathleen Staks, DNR	Assistant Director for Energy
Dan Hernandez, CDRMS	Senior Environmental Protection Specialist
Rob Zuber, CDRMS	Environmental Protection Specialist
Phillip Courtney, SLB	Solid Minerals Leasing Manager
Mike Warren, CPW	Energy Liaison, Northwest Region
Chuck Grobe, Moffat County	County Commissioner
Jeff Comstock, Moffat County	Director, Natural Resources Department

6.3 PREPARERS AND PARTICIPANTS

Table 6.3-1 shows a list of the preparers of this EA and those who participated in the preparation of this EA from OSMRE.

Table 6.3-1 Office of Surface Mining Reclamation and Enforcement

Name	Title
Robert Postle	Manager, Program Support Division
Marcelo Calle	Manager, Field Operations Branch
Nicole Caveny	Environmental Protection Specialist
Bobbi Hernandez	Civil Engineer
Alex Birchfield	Ecologist
Jacob Mullinix	Soils Scientist

Table 6.3-2 shows a list of the preparers of this EA and those who participated in the preparation of this EA from the third party consultants Stantec Consulting and Trinity Consultants.

Table 6.3-2 Consultants

Name	Title	Resource/Role
Greg Brown, Stantec Consulting	Principal	Review and project oversight
Doug Koza, Stantec Consulting	Environmental Scientist	Project Manager
Neil Lynn, Stantec Consulting	Environmental Scientist	Wildlife, Special Status Species
Karla Knoop, Stantec Consulting	Environmental Scientist	Water Resources, Geology, Topography, Soils, Alluvial Valley Floors
Schelle Davis Stantec Consulting	Environmental Scientist	Visual Resources
Stephanie Lauer, Stantec Consulting	Environmental Scientist	Socioeconomics, Environmental Justice, Livestock Grazing, Solid and Hazardous Wastes, Noise
Jenni Prince-Mahoney, Stantec Consulting	Environmental Scientist	Cultural Resources, Indian Concerns, Paleontology, Recreation, Transportation/Access
Daniel Heiser, Stantec Consulting	Manager, Engineering	Air Quality and Modeling
Eric Clark Stantec Consulting	Project Engineer	Air Quality and Modeling
Nick Faust, Stantec Consulting	GIS Analyst	Geographic Information Systems, Mapping
Marcia Williamson, Stantec Consulting	Project Coordinator	Public Comment Analysis
David E. B. Strohm II, Trinity Consultants	Managing Consultant	Air Quality and Modeling

CHAPTER 7 REFERENCES

7.1 REFERENCES

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