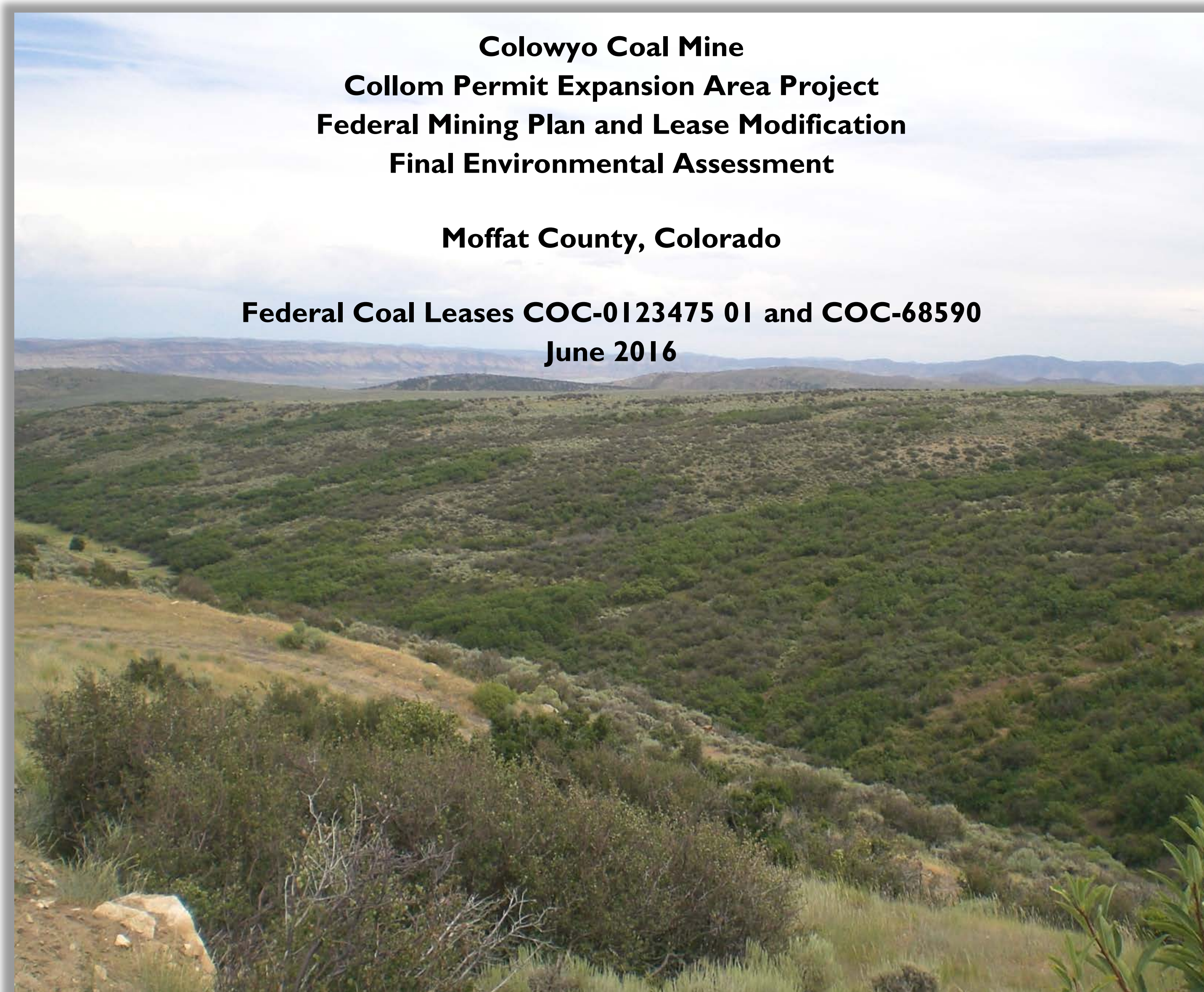
United States Department of the Interior
Office of Surface Mining Reclamation and Enforcement
&
Bureau of Land Management



Colowyo Coal Mine
Collom Permit Expansion Area Project
Federal Mining Plan and Lease Modification
Final Environmental Assessment

Moffat County, Colorado

Federal Coal Leases COC-0123475 01 and COC-68590
June 2016

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Abbreviations and Acronyms

°F	degrees fahrenheit
1989 LSRMP-ROD	1989 Little Snake Resource Management Plan – Record of Decision
2011 LSRMP-ROD	2011 Little Snake Resource Management Plan – Record of Decision
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
AOC	approximate original contour
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
ARMP	Approved Resource Management Plan
ARMPA	Approved Resource Management Plan Amendments
ASLM	Assistant Secretary, Land and Minerals Management
AUM	animal unit month

AVF	alluvial valley floor
BART	Best Available Retrofit Technology
BATFE	Bureau of Alcohol, Tobacco, Firearms, and Explosives
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
CDPS	Colorado discharge permit system
CDRMS	Colorado Division of Reclamation Mining and Safety
CEQ	Council on Environmental Quality
CFC	chlorofluorocarbon
cfs	cubic feet per second
CFR	Code of Federal Regulations
CH_4	methane
CGSSC	Colorado Greater Sage-Grouse Steering Committee
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
CSU	Controlled Surface Use
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
EPA	Environmental Protection Agency

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
FEMA	Federal Emergency Management Agency
FHA	Federal Housing Administration
FCLAA	Federal Coal Leasing Amendments Act
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
ft	feet
FWPCA	Federal Water Pollution Control Act
GHG	greenhouse gas
GHGRP	Greenhouse Gas Reporting Program
GHMA	general habitat management area
gpm	gallons per minute
GRSG	greater sage-grouse
GSGWG	Greater Sage-Grouse Working Group
GWP	global warming potential
GRP	gross regional product

H	height
HAP	Hazardous Air Pollutant
HCFC	hydrochlorofluorocarbon
HDPE	High Density Polyethylene
HPA	High Potential Area
Hr	hour
IMPROVE	Interagency Monitoring of Protected Visual Environments
IPCC	Intergovernmental Panel on Climate Change
km	kilometer
kV	kilovolt
lbs	pounds
Leq	equivalent sound level
LOWWIND2	low wind speed option 2
LSFO	Little Snake Field Office
LSRMP	Little Snake Resource Management Plan
LUP	Land Use Plan
MATS	Mercury and Air Toxics Standards
MBTA	Migratory Bird Act
MD	management decision
MDN	mercury deposition network
MFP	Management Framework Plans
Mg/L	milligrams per liter
MLA	Mineral Leasing Act
MLRB	Mined Land Reclamation Board

MMPA	Mining and Minerals Policy Act
mmt	million metric tons
MOU	Memorandum of Understanding
MPDD	mining plan decision document
MSHA	Mine Safety and Health Act
mt	metric ton
mtpy	million tons per year
m/s	meters per second
MW	megawatt
N	north
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
NO_x	nitrogen oxide
N_2O	nitrous oxide

NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NSPS	New Source Performance Standards
NWI	National Wetlands Inventory
O_3	ozone
OHV	off-highway vehicle
OHWM	ordinary high water mark
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
PDF	preferred design features
PEL	permissible exposure limit
PERA	Prescribed Ecological Reclamation Approach
PFYC	Potential Fossil Yield Classification
PHMA	preliminary habitat management area
PM	prime meridian
$PM_{2.5}$	particulate matter 2.5 microns
PM_{10}	particulate matter 10 microns

ppb	parts per billion
ppm	parts per million
PR	Permit Revision
PSD	Prevention of Significant Deterioration
QAPP	Quality Assurance Project Plan
R	Range
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	Township
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
µg/m3	micrograms per cubic meter of air
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
V	vertical
VER	valid existing rights
VMT	vehicle miles traveled
VOC	volatile organic compound
VRI	visual resource inventory
VRM	Visual Resource Management
W	west

WOTUS	Waters of the U.S.
WYBC	western yellow-billed cuckoo

CHAPTER 1 PURPOSE AND NEED[1]

1.1 INTRODUCTION

This Environmental Assessment (EA) has been prepared by the Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region Office, Department of the Interior (DOI) and the Bureau of Land Management (BLM), Little Snake Field Office (LSFO), DOI in cooperation with the State of Colorado, Department of Natural Resources (DNR). The EA analyzes the potential environmental effects of a mining plan modification (the Project) proposed by the Colowyo Coal Company L.P. (Colowyo) to surface mine federally leased coal within the Colowyo Coal Mine Collom Permit Expansion Area at the Colowyo Coal Mine. The EA also analyzes the potential environmental effects of a lease modification proposed by Colowyo to add 27.84 acres of unleased federal land to federal coal lease COC-0123475 01. Access to those lands would be necessary for implementation of the Project *and could only be authorized if those lands were included in a federal coal lease through a lease modification approved by BLM. While there is no economically recoverable coal within the 27.84 acres of the lease modification area, and no coal would be mined there, use of the surface of those lands would be necessary for reclamation activities or for the placement of mine components, both of which would directly facilitate the development of coal resources on leases COC-0123475 01 and COC-68590*. The Colowyo Coal Mine is located approximately 26 miles (41.8 kilometer [km]) southwest of Craig, Colorado and 22 miles (35.4 km) north-northeast of Meeker, Colorado, west of Colorado Highway 13/789 in southwest Moffat and northern Rio Blanco Counties, Colorado (**Figure 1-1**).

The National Environmental Policy Act (NEPA) of 1969 requires federal agencies to disclose to the public the potential environmental impacts of projects they authorize. NEPA also requires agencies to consider and analyze reasonable alternatives to projects that are proposed. Lastly NEPA requires agencies to make a determination as to whether the analyzed actions would “significantly” impact the environment. “Significantly” is defined by NEPA and is found in regulation 40 Code of Federal Regulations (CFR) 1508.27. If OSMRE and/or BLM determine that this Project would have significant effects following the analysis in the EA, then an Environmental Impact Statement (EIS) would be prepared for the Project. If the potential effects are not determined to be “significant”, a “Finding of No Significant Impact” (FONSI) statement would document the reason(s) why implementation of the selected alternative would not result in significant environmental effects. An EA provides evidence for determining whether to prepare an EIS or a FONSI statement.

This EA analyzes the potential effects of approving both a federal coal lease modification and a surface mining plan modification that would authorize mining activities to produce up to 5.*0 million tons per year (mtpy)* of coal from Colowyo’s federal coal leases, COC-0123475 01 and COC-68590. A decision on the lease modification is a separate federal action from a decision on the mining plan modification. However, because there would be no need for the lease modification without the proposed mining plan modification, and the mining plan modification as

[1] *Italicized text denotes language inserted either in response to comments received on the EA (see **Appendix E**) or to clarify or update a topic based on new or additional information received. Each place where italicized text appears is denoted by a bar in the left hand margin.*

proposed could not be approved without the prior approval of the lease modification, both federal actions are analyzed together in the EA. In addition, the lease modification action is not analyzed distinctly in the EA; instead, the impacts of the proposed changes to the mining plan, which include use of the lease modification tract, are analyzed as a whole and disclosed in the document.

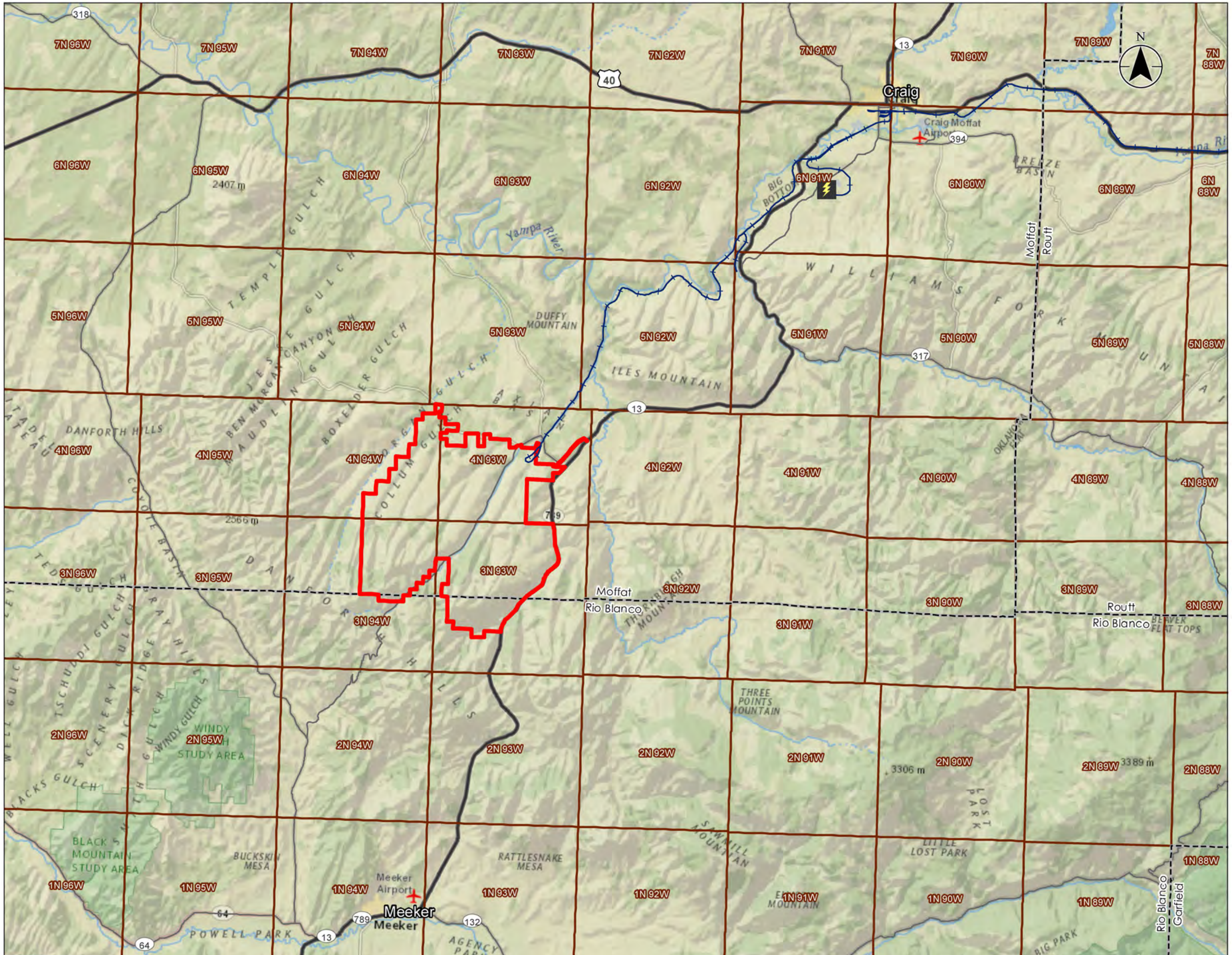
This Project EA has been prepared in accordance with NEPA and the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR 1500-1508); the Surface Mining Control and Reclamation Act (SMCRA) of 1977; the 1989 Little Snake Resource Management Plan (LSRMP) – Record of Decision (ROD) (1989 LSRMP-ROD) (BLM 1989); the BLM 2011 LSFO RMP and ROD (2011 LSFO RMP-ROD) (BLM 2011); the BLM 2015 Northwest Colorado Approved RMP Amendment for the Rocky Mountain Region Greater Sage-grouse Sub-Regions (BLM 2015); the BLM National Environmental Policy Act Handbook H-1790-1 (BLM 2008); and OSMRE guidance on implementing NEPA, including the OSMRE Handbook on Procedures for Implementing the National Environmental Policy Act (OSMRE 1989). Information gathered from 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.

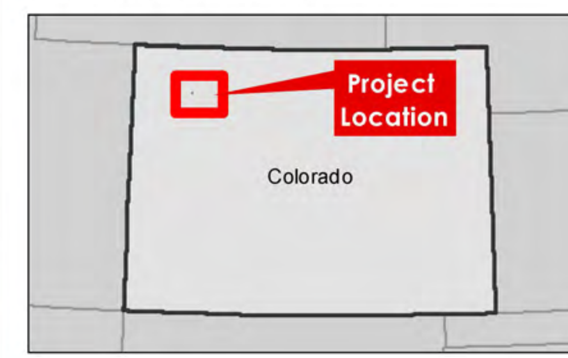
1.2 BACKGROUND

1.2.1 Colowyo Mining Operations History

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. Then 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. 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.

This Project is an expansion of the existing Colowyo Coal Mine. Colowyo, operator of the Colowyo Coal Mine, is a limited partnership, which is indirectly owned by *Elk Ridge Mining and Reclamation*. *Elk Ridge Mining and Reclamation* is owned by Tri-State Generation & Transmission Association, Inc. Colowyo currently operates the Colowyo Coal Mine on Federal Coal Leases COC-29225 and COC-29226 and is producing coal from the South Taylor Pit. Colowyo operates the existing Colowyo Coal Mine under Coal Mining Permit number C-1981-019 issued by the Colorado Division of Reclamation Mining and Safety (CDRMS) in accordance with their approved Colorado State Coal Regulatory Program (30 CFR Part 906) issued under SMCRA. Currently, the Colowyo Coal Mine produces approximately 2.3 mtpy and provides coal primarily to the Craig Generation Station located in Craig, Colorado. However, the mine has produced coal at a maximum rate of 6.4 mtpy in the past (2004) and 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 has also responded to numerous requests for smaller samples of coal to conduct





Approved SMCRA Permit Boundary

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

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

1-1

Title

Regional Overview

test burns for possible future contracting. Colowyo is actively marketing its coal and if a contract is secured would ship to other users. The Colowyo Coal Mine 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.

1.2.2 Colowyo's State SMCRA Mine Permit Revision

In order to timely plan for the depletion of coal reserves in the current mining area and ensure continued mining operations, on January 26, 2009, Colowyo submitted an application for a permit revision to CDRMS to expand the boundary approved in their existing SMCRA permit. The revision proposed adding approximately 16,824.8 acres of a combination of private, federal and state surface lands and subsurface mineral estate to the previously approved permit area of 12,250.95 acres, also comprised of a mixture of private, federal and state surface lands and mineral estate, and proposed surface mining in 2 new pits. On May 29, 2013, CDRMS approved Colowyo's Permit Revision No. 3 (PR 03) for the Collom Permit Expansion Area. The Permit Expansion Area includes all or portions of Colowyo's federal coal leases, COC-29225, COC-0123475 01, COC-0123476 01, and COC-68590, the Jubb State Lease 257-13s, private lands owned by Colowyo, and the unleased federal lands. Within the Collom permit expansion area, 637.0 acres of surface and associated mineral estate are owned by the State of Colorado; 2,525.18 acres of surface estate and 5,743.50 acres of mineral estate in the federal coal leases are managed by the BLM; and 13,662.61 (surface and mineral estate) acres are privately owned by Colowyo. The proposed Project is located within a portion (4,823 *surface* acres) of the overall Permit Expansion Area that includes two of the federal leases, COC-0123475 01 and COC-68590, 27.84 *surface* acres of unleased federal land (both surface and mineral estate) located in Township (T) 4 North (N), Range (R) 94 West (W), 6th Prime Meridian (PM), Section 26 Lot 3, E½, SE ¼; the Jubb State Lease 257-13s; and additional Colowyo owned private surface and coal lands.

1.2.3 Federal Coal Leasing History

The Federal Coal Leasing Amendments Act of 1976 (FCLAA) amended the Mineral Leasing Act of 1920 (MLA) to generally require all federal coal leases to be offered competitively either by regional leasing, under which BLM selects the tracts, or through a lease by application process, under which the public nominates coal tracts for competitive leasing.. In 1979, BLM completed the Final EIS for the Federal Coal Management Program and the Secretary of the Interior adopted a new regional leasing program for the management of coal resources on federal lands. The program established twelve Regional Coal Leasing Teams throughout the United States. Colorado and Wyoming were included in the Green River/Hams Fork Regional Coal Team. 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). The regional coal leasing process required BLM to select tracts for competitive coal leasing based on a number of factors including land use planning, expected coal demand, and the potential environmental and economic impacts. This process worked well while new coal mines were being developed, but once most new mines were developed, demand for new coal leases focused on extensions of existing mines, rather than on new mining areas. To address this shift, BLM moved to the lease by application process, under which all current federal coal leasing is conducted in accordance with BLM regulations at 43 CFR 3425 – Leasing on Application.

In May 1982, BLM issued lease COC-0123475 01 to Utah International under BLM's Preference Right Lease Application process. That lease was assigned to Colowyo in 1994. And then in 2004, Colowyo submitted a Lease-by-Application to the BLM to lease the federally owned coal in the Collom Lease tract through a competitive leasing process. In 2006, BLM completed their evaluation of the site specific potential environmental impacts of the proposal to lease the Collom Tract in the "Environmental Assessment for Lease-by-Application, Collom Lease Tract" (2006 BLM EA). As a reasonably foreseeable future action of lease issuance, the 2006 BLM EA analyzed the potential environmental impacts of a conceptual surface mine plan to produce 6 million tons per year of coal, nearly 1 mtpy year higher than proposed for the Collom Project. The conceptual mine plan analyzed in the 2006 BLM EA included the same mining method, mine facilities, and access route as is analyzed in this EA. Based on the 2006 BLM EA, BLM reached a FONSI and issued federal coal lease COC-68590 to Colowyo in July 2007, with lease stipulations[2]. Lease stipulations are in addition to the standard terms and conditions of a lease and describe specific requirements for the lessee to protect and/or minimize potential impacts on other resource values and/or other public land uses.

1.2.4 Colowyo's Proposed Action

The Proposed Action (Alternative A) is to mine coal approximately three miles (4.8 km) northwest of Colowyo's existing mining operations in the South Taylor Pit. The proposed mining plan modification would involve developing two mine pits, the Collom Lite Pit and the Little Collom X Pit, using truck/shovel, dragline and highwall surface mining techniques as well as constructing haul roads and mine support facilities. The mined coal would be trucked to a primary crusher and then transported northeast along the west fork and main stem of Jubb Creek for approximately six miles (9.7 km) to the existing Gossard loadout. An action alternative (Alternative B) is also analyzed that proposes mining only the Collom Lite Pit, designs several mine components (e.g. facilities, topsoil stockpiles, and the temporary overburden stockpile) to enhance protection of Greater sage-grouse (GRSG) and its habitat, and includes specific additional measures not included in Alternative A to protect GRSG and its habitat. The approval of the lease modification would be necessary to implement both Alternative A and Alternative B. Chapter 2 includes detailed descriptions of the alternatives analyzed in this EA.

Of the 16,824.79 acres currently contained within the CDRMS approved permit revision area, approximately 2,090.5 acres would be disturbed under Alternative A over the anticipated *21* year life of the Project. Under Alternative B, approximately 2,637 acres would be disturbed over the anticipated shorter *17* year life of the Project when compared to Alternative A. Under both action alternatives, reclamation operations would begin as soon as possible after initiation of coal removal and continue until after mining has been completed and all requirements have been successfully accomplished. Reclamation would include but not be limited to backfilling of the mine pits, grading of all disturbed areas to handle erosion and restore the landscape to the approximate original contour (AOC) of the pre-mining topography, replacement of topsoil, and revegetation using suitable approved species. Colowyo's post-mining land use goal is the re-establishment and enhancement of multiple-use Rangeland/Fish and Wildlife Habitat focused on

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[2] *See Section 1.5.2. For more information on lease stipulations, contact the BLM LSFO.*

improved range condition and the creation of wildlife habitat specific to GRSG brood-rearing habitat.

1.3 STATUTORY AND REGULATORY BACKGROUND

1.3.1 OSMRE Mining Plans and Mining Plan Modifications

For new mining plans, OSMRE prepares a mining plan decision document (MPDD) in support of its recommendation to the Assistant Secretary for Land and Minerals Management (ASLM), delegated by the Secretary of the DOI (Secretary). 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 to approve, disapprove or conditionally approve the mining plan modification. 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;[3]
- 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 the 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.

1.3.2 BLM Lease Modification

BLM regulations at 43 CFR Subpart 3432 provide lessees the opportunity to apply for approval of a "lease modification" to add less than 960 acres of unleased lands to an existing lease, which would grant right of entry to the lands to the lessee for the purpose of developing federal coal resources. *Colowyo proposes to disturb up to 27.84 acres of federal lands that are currently unleased but adjacent to their federal coal lease COC-68590.* Although Colowyo has determined that there are no economically recoverable, federal coal resources within the lease modification parcel *of*

[3] 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 Section 7 consultation for threatened and endangered species potentially affected by the proposed mining plan modification under the Endangered Species Act of 1973) (USFWS 2006 and 2007), and the National Historic Preservation Act of 1966 "Section 106" consultations for the affected area (CHS 2007).

27.84 acres, and no coal would be mined from those lands, disturbance of the surface of those lands would be necessary under both Alternative A and Alternative B for reclamation activities or for the placement of mine components respectively, both of which would directly facilitate the development of coal resources on leases COC-0123475 01 and COC-68590.

On January 15, 2016, the Secretary of the Interior issued Secretarial Order (SO) No. 3338, Discretionary Programmatic Environmental Impact Statement to Modernize the Federal Coal Program. The SO places a pause on issuing new and pending federal coal leases (with exceptions provided in Section 6 of the SO for specific circumstances, including: "(b) lease modifications, as defined in 43 CFR Subpart 3432.1, that do not exceed 160 acres, or the number of acres in the original lease, whichever is less;") until the DOI undertakes and completes a comprehensive review of the federal coal leasing and management program. However, in Section 1 Purpose, the SO explicitly states that it does not apply to any action of OSMRE. The lease modification application being analyzed by BLM in this EA is for 27.84 acres and the associated lease encompasses 1,406.71 acres, which therefore qualifies for the exclusion under Section 6 (b) of the SO. OSMRE's action on the mining plan modification also is excluded from the SO under Section 1 of the SO. Upon BLM approval of a lease modification, *the ASLM could approve* mining and/or related operations on lands *covered* under the *proposed* mining plan modification*, including the lands within the lease modification.*

1.4 PURPOSE AND NEED

As described at §1502.13 (40 CFR 1500-1508) the purpose and need statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action.

Purpose: The purpose of the action is established by the MLA and the SMCRA, which requires the evaluation of Colowyo's proposed mining plan modification for the Collom Permit Expansion Area before Colowyo may conduct surface mining and reclamation operations to develop Federal Coal Leases COC-0123475 01 and COC-68590. OSMRE is the agency responsible for making a recommendation to the ASLM to approve, disapprove or approve with conditions the proposed mining plan modification. The ASLM will decide whether the mining plan modification is approved, disapproved, or approved with conditions.

The purpose of the action also arises from BLM's responsibility under the MLA as amended and the FCLAA, which requires *BLM's* evaluation of Colowyo's application to modify federal Lease COC-0123475 01 by adding approximately 27.84 acres of unleased public lands to that lease. *Colowyo needs to utilize the surface of those currently unleased public lands to facilitate development of federal coal resources on leases COC-0123475 01 and COC-68590, and place mine components and perform reclamation activities on those lands. There is no economically recoverable coal within the 27.84 acres of the lease modification area, and no coal would be mined from those lands.* BLM is the agency responsible for making a decision on the lease modification application. BLM will decide whether to approve all or part of the lands in the application, or to disapprove the application in its entirety.

Need: The need for the action is to provide Colowyo the opportunity to exercise its valid existing rights (VER) granted by BLM under federal coal leases COC-0123475 01 and COC-68590 to access and mine undeveloped federal coal resources located in the Collom Permit

Expansion Area at the Colowyo Coal Mine. *Additionally the need for the project is to provide Colowyo the opportunity to meet its requirements under the MLA for commercial coal quality diligence and continued operation year obligations.*

1.5 RELATIONSHIP TO STATUTES, REGULATIONS AND OTHER AGENCY PLANS

1.5.1 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 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 1973 *(CSCMRA)*

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. 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 has worked with coal producing states to develop their own regulatory programs to permit coal mining with OSMRE in an oversight role. CDRMS manages its own coal regulatory program under SMCRA and the Colorado Surface Coal Mining Reclamation Act of 1979. CDRMS has the authority and responsibility to make decisions to approve SMCRA mine permits and regulate coal mining under Regulations of the Colorado Mined Land Reclamation Board for Coal Mining (revised 09/14/2005).

1.5.2 Other Agency Plans

The BLM LSFO manages approximately 1.3 million surface acres and an additional 1.1 million acres of mineral estate in northwest Colorado, including BLM managed surface and mineral estate located in the Project Area. As required by FLPMA, BLM periodically prepares and revises land use plans (i.e. RMPs) 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. The RMP, which was in effect when the federal leases were issued and which guides the BLM decisions for proposals on the subject coal leases, is the 1989 LSRMP-ROD, signed on April, 26 1989, and published in June, 1989. The 1989 LSRMP-ROD documents BLM's resource analysis and land management decisions and states the following specific objectives for coal:

- Maximize the availability of the federal coal estate for exploration and development; and,
- Facilitate orderly, economic, and environmentally-sound exploration and development of the coal resource within the principles of balanced multiple use management.

The subject federal coal leases are located within the 1989 LSRMP-ROD Management Unit 1: Eastern Yampa River, which contains the majority of the in-place coal resources (6.1 billion tons within 3,000 feet of the land surface) within the coal planning area for the 1989 LSRMP-ROD. This management unit has the following specific management objective:

- The management objectives of this unit are to realize the potential for development of coal, oil, and gas resources (BLM 1989).

Development and mining of federal coal resources on the subject federal coal leases under both the Alternative A and Alternative B is in conformance with the general coal management objectives of the 1989 LSRMP-ROD and the specific objectives of the LSRMP-ROD Management Unit 1: Eastern Yampa Management Unit.

In accordance with the 1989 LSRMP-ROD, development of federal coal resources would also be subject to the following management action for wildlife habitat:

- Wildlife habitat will be maintained or improved through mitigation or restrictions applied to all wildlife habitat disturbing activities (BLM 1989).

Further, the Eastern Yampa Management Unit objectives for wildlife state:

- Wildlife habitats, including threatened and endangered species habitats, will be protected by limits or restrictions placed on the development of federal coal, as the result of the application of the coal unsuitability criteria (see appendices 1 and 2) (BLM 1989).

Appendix 2 of the 1989 LSRMP-ROD (Federal Lands Review, Methodology Used In Identifying Areas Acceptable For Further Coal Leasing Consideration) identifies a stipulation that requires the lessee to mitigate for mule deer, elk, antelope, and Greater sage and sharp-tailed grouse habitat loss where applicable and the resultant loss or displacement of these species as key indicator species due to surface coal mining operations. The stipulation was attached to the subject leases when they were issued. In compliance with this stipulation for the Proposed Action, Colowyo developed the following plans as part of its application for revision of its SMCRA PAP (PR 03), which identify specific mitigation actions for the protection and replacement of GRSG and other wildlife species habitats: 1) Reclamation Plan (**Appendix A**); and 2) Fish and Wildlife Plan (**Appendix B**, pg. 6). Implementation of the Reclamation Plan is designed to result in an increase in GRSG habitat post-mining when compared to pre-mining. These plans were reviewed by *Colorado Department of Parks and Wildlife (*CPW*)* and BLM, approved by CDRMS, and incorporated as required mitigation measures under approved PR 03.

Alternative B includes the CDRMS approved GRSG and other wildlife *design feature* requirements in **Appendices A** and **B** that comply with the lease stipulation, and includes additional proposed *design features* specifically for the protection of GRSG, described in more detail in Chapter 2. In general, the additional *design features* would: 1) relocate surface disturbance to a minimum distance of at least 0.9 mile (1.5 km) from the closest active GRSG lek; *2) ensure no surface disturbing activities within 1.0 miles of an active lek during the nesting and early brood rearing season; 3*) ensure the preservation in perpetuity of GRSG habitat located outside the permit area, of similar type and equivalent acreage to that which would be disturbed both directly and indirectly by mining operations; and *4*) provide funding to conduct monitoring of the potential impacts of surface coal mining on the GRSG.

Both Alternative A and Alternative B would be in conformance with the 1989 LSRMP-ROD management action to protect wildlife habitat through compliance with the associated lease stipulation.

In October 2011, the LSFO approved a new RMP and associated ROD (2011 LSFO RMP-ROD) (BLM 2011) for the public lands under its jurisdiction. Colowyo's leases were issued by BLM in conformance with the decisions of the1989 LSRMP-ROD and therefore were established as VER prior to approval of the new RMP. As is recognized and stated in the 2011 LSFO RMP-ROD, an 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 (BMPs) required by

BLM in accordance with the 2011 LSFO RMP-ROD would need to be consistent with the VER granted in existing leases. Since Colowyo's leases were issued under the 1989 RMP, are in conformance with that RMP and are VER, Alternative A and Alternative B for the mining plan are not required to be in conformance with the 2011 RMP. However, COAs and BMP's identified in the 2011 RMP that are consistent with the VER of Colowyo's leases could be required by BLM.

The 2011 LSFO RMP-ROD also balances protection of other key resources and habitats, recreation opportunities and multiple uses, including coal mining, and sets the following goal and objectives for coal (page RMP-36):

> "**Goal C (Coal and Oil Shale):**
>
> Allow for the availability of the federal coal and oil shale estate for exploration and development.
>
> Objectives for achieving these goals include:
>
> > - Identify and make available the federal coal and oil shale estate for exploration and development, consistent with appropriate suitability studies, to increase energy supplies.
> >
> > - Facilitate reasonable, economical, and environmentally sound exploration and development of the federal coal and oil shale estate.
> >
> > - Promote the use of BMPs, including implementation of sound reclamation standards."

Alternatives A and B are consistent with, and the proposed Lease Modification is in conformance with the above general goal and objectives for coal in the approved 2011 LSFO RMP-ROD.

The 2011 LSFO RMP-ROD also contains Management Actions for Allowable Uses and Actions for a number of other resources that could be considered for application to the Project such as Fish and Wildlife Habitat (pages RMP-18 - RMP-22). These management actions would impose controlled surface use (CSU), timing limitations, and no surface occupancy (NSO) limitations on oil and gas and other surface disturbing activities. The Lease Modification would be subject to the appropriate management actions. However, as described above, as applied to the existing leases under Alternatives A and B, these management actions would need to be consistent with the VER.

On September 22, 2015, BLM issued the ROD and Approved Resource Management Plan Amendments (ARMPA) as *well as the* Approved Resource Management Plans (ARMP) for the Rocky Mountain Region Greater Sage-Grouse (GRSG) Sub-Regions (BLM 2015). The ARMPAs and ARMPs resulted from a landscape–level management strategy to conserve GRSG habitat on public lands that was developed by the BLM in coordination with the U.S. Forest Service. The ARMPs and ARMPAs include a suite of management actions, such as establishing disturbance limits, GRSG habitat objectives, mitigation requirements, monitoring protocols, and adaptive management triggers and responses. They also include other conservation measures that apply throughout designated habitat management areas. Objective MR-7 of the Northwest Colorado GRSG ARMPA indicates that the solid mineral programs should be managed to avoid, minimize, and compensate for adverse impacts to GRSG habitat to the extent practical under the law and BLM jurisdiction (BLM 2015). The ARMPA also recognizes VER and only those management actions that are consistent with the VER of Colowyo's leases could be required by BLM. For existing coal leases, the ARMPA, Management Decision (MD) MR-23 encourages lessees to voluntarily follow Preferred Design Features (PDF) to reduce or mitigate any potential impacts to GRSG. PDFs are listed in Appendix C, Table C-1 of the ARMPA (BLM 2015). Alternative A (Proposed Action) *for the Collom Permit Expansion Area Project* incorporates design features to protect and/or enhance GRSG habitat and Alternative B incorporates both those design features and additional such design features collaboratively developed by Colowyo, BLM, OSMRE, CPW, and USFWS.

The lands included in the proposed Lease Modification are not subject to VER and are managed by BLM under the objectives and management actions for GRSG of the 2015 Northwest Colorado ARMPA. The proposed Lease Modification would be a key component of both Alternative A and Alternative B to allow access for location of mine components that would facilitate exercise of VER and development of Colowyo's existing federal coal leases. For Alternative B, the proposed Lease Modification would also facilitate reducing potential impacts on a GRSG lek (lek SG 4) by allowing access for a redesign of mine components that would result in relocating mine operations a minimum of 0.9 miles (1.5 km) from lek SG 4.

MD MR-23 of the 2015 Northwest Colorado ARMPA at page 2-18 provides for the following regarding expansion of existing leases:

"To authorize expansion of existing leases, the environmental record of review must show no significant direct disturbance, displacement, or mortality of GRSG based on these criteria:

- Important GRSG habitat areas as identified by factors, including, but not limited to, average male lek attendance and/or important seasonal habitat
- An evaluation of the threats affecting the local population as compared to benefits that could be accomplished through compensatory or off-site mitigation
- An evaluation of terrain and habitat features. For example, within 4 miles (6.4 km) from a lek, local terrain features such as ridges and ravines may reduce the habitat importance and shield nearby habitat from disruptive factors."

This EA considers the criteria above.

*Approximately 948 acres of the Project Area is designated as GRSG General Habitat Management Area (GHMA) and approximately 3,897 acres is Priority Habitat Management Area (PHMA) (**Section 3.9.2.5**). Appendix B of the Northwest Colorado ARMPA identifies the minimum buffer distances within which BLM will assess and address impacts on GRSG for various types of disturbances or activities. However, the ARMPA does not preclude activities and disturbances, and associated impacts on GRSG, within the buffer zones. The following types of activities and associated lek buffer distances apply to the Collom project:*

- *"Surface disturbance (continuing human activities that alter or remove the natural vegetation) within 3.1 miles (5.0 km) of leks"*

Both alternatives presented in this EA would disturb the surface of lands within the 3.1 mile (5.0 km) lek buffer distance described above. Alternative A would disturb the surface of lands within approximately 320 feet of a lek site (lek SG 4). Under Alternative B there would be no surface *disturbance within 0.9 mile (1.5 km) of lek SG 4, a much greater distance than proposed under Alternative A. In addition, for Alternative B, Colowyo considered site specific data on GRSG collected by CPW, both within and adjacent to the Project Area, in developing that alternative. That data was also used by Colowyo to develop the design features for Alternative B that specifically address the potential impacts on GRSG from surface disturbance proposed within the buffer zone, as described above as well as in Chapter 2, **Section 2.4.3**, and in Chapter 4, **Section 4.9**. The design features were developed cooperatively with CPW, OSMRE, BLM, and USFWS and approved by CPW, OSMRE and BLM.*

*As described above, Appendix B of the ARMPA anticipates the potential for disturbance and impacts within the 3.1 mile (5.0 km) buffer zone, and requires that those potential impacts would be assessed and addressed by BLM. Since the ARMPA does not preclude impacts on GRSG within the buffer zone, and this EA assesses and addresses potential impacts on GRSG from surface disturbance proposed under the alternatives as required in Appendix B, both Alternatives A and B are in conformance with the ARMPA. In addition, since the ARMPA recognizes VER, and Colowyo's federal leases are VER in the context of the ARMPA, both alternatives would also be in conformance with the ARMPA for this reason. Lastly, the donation of 4,540 acres of PHMA, the relinquishment of grazing and mineral rights on that land to CPW, and the donation of $150,000 to CPW to fund monitoring of GRSG in the vicinity of the mine by CPW under Alternative B (**Section 4.9.2.2**) would result in a net conservation gain to GRSG. CPW ownership, control, and management of the donated lands would, in perpetuity, eliminate the risk and potential for future development or change of use on those donated lands that would reduce GRSG habitat or otherwise adversely affect the species in this area. Further, the funding donated to CPW to monitor GRSG in the vicinity of the mine would provide important species behavior information, not currently available, on the response of GRSG to surface mining activities, starting before a mine operation is even initiated. This information would fill an important data gap for GRSG and would be critical for developing new, effective measures to conserve the species. These measures would meet the ARMPA management action of requiring BLM to require and ensure mitigation that provides a net conservation gain to GRSG (ARMPA MD SSS-3).*

1.6 AUTHORIZING ACTIONS

In general, two separate approvals are needed for a coal mine operator to conduct mining operations on federal coal leases: 1) an approved SMCRA mine permit*, or revision of a previously approved mine permit,* by the regulatory authority, in this case CDRMS; and 2) an approved mining plan, or modification of a previously approved mine plan, by the ASLM. *In addition, for this project, a BLM lease modification approval is needed to add 27.84 acres of currently unleased public lands to Colowyo's adjacent federal coal lease COC-68590 in order to locate mine facilities and perform reclamation activities that would facilitate the development of federal coal resources on lease COC-68590. However, the lands included in the lease modification do not contain economically recoverable coal and no coal mining would occur on those lands.*

1.6.1 State SMCRA Mine Permit Revision

The SMCRA mine permit approval by CDRMS provides the basis for the Secretary's decision on the mining plan or mining plan modification. On April 10, 2013, CDRMS issued a proposed decision to approve with conditions PR 03 for the Project, and a finding of compliance with the Colorado Surface Coal Mining Reclamation Act, for the Colowyo Coal Mine (Permit No.C-1981-019). Then on May 29, 2013, CDRMS approved Colowyo's SMCRA PR 03, with conditions, including the requirement that the ASLM must approve a mining plan modification before mining of federally leased coal can begin, in conformance with the MLA.

1.6.2 OSMRE Mining Plan Modification

In accordance with 30 CFR 746.13, OSMRE will prepare and submit to the ASLM a MPDD recommending approval, disapproval, or conditional approval of the mining plan modification. Prior to developing and submitting the MPDD to the ASLM, OSMRE will consult with federal and state agencies, Native American Tribes, local governments and the public; prepare this EA to disclose the potential environmental effects of the Project to the public, consider alternatives; determine whether the potential effects of the Project and alternatives considered are significant; and comply with other applicable federal laws and executive orders.

1.6.3 BLM Lease Modification

BLM must approve a Lease Modification before unleased public lands can be added to a federal coal lease, and operations supporting mining can be authorized and initiated on those lands. In accordance with BLM regulations at 43 CFR Subpart 3432 Lease Modifications, a federal coal lessee may apply for a lease modification to the BLM State Office having jurisdiction, in this case the Colorado State Office. In order to approve a modification that includes all or part of the lands applied for, BLM will review the reasons for the modification. BLM must determine that the modification serves the interests of the United States, that there is no competitive interest in the lands, that the lands proposed to be added cannot be developed as part of another independent operation*, and that approval of the lease modification is in compliance with SO 3338*. If BLM determines that the proposed Lease Modification application does not meet the above requirements, BLM may disapprove the application.

1.7 OUTREACH AND ISSUES

Public comments were initially solicited by publishing a Legal Notice in the Rio Blanco Herald Times and the Craig Daily Times on September 26 and 27, 2013, respectively. The Notice described the Project in summary form, informed the public that a public outreach meeting for the EA was scheduled for October 10, 2013 at the BLM LSFO and that public comments would be accepted until October 31, 2013. The Notice was also posted at various public locations in Craig and Meeker, Colorado. OSMRE created a Project website, http://www.wrcc.osmre.gov/initiatives/colowyo.shtm, which provided the notice and other Project and comment opportunities available on the website. An outreach letter describing the Project, announcing the public outreach meeting, and soliciting comments was mailed on September 26, 2013 to 45 recipients including BLM, Native American Tribes, state agencies, city and county governments, adjacent landowners, and other interested parties.

The uncertainty in the length of the federal government shutdown beginning October 1, 2013 required that the public outreach meeting originally scheduled for October 10, 2013 be postponed. A letter announcing the outreach meeting postponement was mailed to the original 45 recipients on October 1, 2013, and on October 2 and 3, 2013, Legal Notices about the postponement were published in the Craig Daily Times and Rio Blanco Herald Times, respectively and also posted at public places in Craig and Meeker, Colorado. After the federal government resumed operation on October 17, 2013, a new outreach meeting date was determined, November 7, 2013. On October 22, 2013, an outreach letter was mailed to the 45 original recipients announcing the new meeting date and that the public comment period was extended to November 14, 2013. Legal Notices containing the same information were published in the Rio Blanco Herald Times on October 24 and 31, 2013 and in the Craig Daily Times on October 25 and November 1, 2013. The new Legal Notices were also posted at public locations in Craig and Meeker, Colorado and the BLM LSFO posted a notice on the Field Office website about the outreach meeting and created a link to the OSMRE Project website.

The public outreach meeting was held on November 7, 2013 at the BLM LSFO from 4:00 PM until 8:00 PM. Sixty-five people attended and six submitted comment forms onsite. A total of 19 comment forms or email comments were received by the end of the comment period. Most of the comments were in favor of approving the mining plan and 558 people signed a petition on the Change.org website in favor of the mining plan approval. These comments were generally based on: 1) benefit to and reliance of the local economy on continued coal mining; 2) the Project itself has measures built into it that already adequately protect the environment; 3) other public and private projects in the area have greater impacts on the resources than the Project; 4) Colowyo is a good environmental steward; and 5) the Project will provide high quality fuel to power generation plants.

Several comments raised concerns about potential adverse impacts including: 1) additional traffic on county roads; 2) increased dust on adjacent private lands; 3) potential impacts on the quality of domestic water wells and livestock and wildlife watering structures adjacent to the mine; and 4) potential increases in noise levels on adjacent private lands.

One commenter raised several concerns including: 1) the need to complete an EIS under NEPA to analyze this Project; 2) the direct and indirect surface impacts of mining the lease including impacts to rare imperiled fish, wildlife, and plants; surface water quality; air quality; and climate change; 3) connected actions and impacts that need to be addressed, at least as indirect impacts, including the operation of the Craig Station; coal handling, hauling, and transport; infrastructure maintenance and improvements; and water diversion and water transport to the mine and power plants; 4) the need for cumulative impacts of other activities to be analyzed and assessed such as oil and gas development, other coal fired power plants in the region, other coal mines in the region, and off-road vehicle use; and 5) that a range of reasonable alternatives must be rigorously explored and objectively evaluated including alternative mining levels; underground mining; use of low or no pollutant emitting mining equipment and other air quality mitigation alternatives; undertaking actions to limit or reduce other greenhouse gas emissions; and offsite mitigation or compensation for the impacts in other ways. All comments received have been considered in the preparation of this document.

CHAPTER 2 PROPOSED ACTION AND ALTERNATIVES[1]

2.1 INTRODUCTION

This chapter provides background information on Colowyo's existing operations at the Colowyo Coal Mine, and describes Colowyo's Alternative A (Proposed Action), Alternative B (Reduced Mining), Alternative C (No Action), and alternatives that were considered, but eliminated from detailed analysis. The description of Alternative A and much of the description of Alternative B are based on the PAP and the PR03 submitted by Colowyo to the CDRMS on January 26, 2009 and approved by the CDRMS on May 29, 2013 (CDRMS 2013a). Readers desiring greater detail can review the additional descriptions, maps, and drawings contained in the PAP, which is available at the Colowyo Mine Administration Office at 5731 State Highway 13 Meeker, CO 81641, the BLM LSFO at 455 Emerson Street Craig, CO 81625, the Colorado Division of Reclamation Mining and Safety at 1313 Sherman Street Denver, CO 80203, and the Office of Surface Mining Reclamation and Enforcement at 1999 Broadway, Suite 3320 Denver, CO 80202.

2.2 EXISTING OPERATIONS

Colowyo commenced surface mining in 1977 and has mined from four distinct pits during the life of the existing operation. The East Pit was the first pit opened and where mining concluded in 2006. The East Pit is in the final stages of reclamation and will be completely reclaimed in 2016. Mining commenced in the Section 16 Pit in 1992 and continued until 2002. Mining in the Section 16 Pit was a single seam operation, whereas, the other pits at Colowyo have required the mining of multiple seams. Reclamation on a majority of the Section 16 Pit occurred from 1993 to 1998. The remaining acres of the Section 16 Pit that have not been reclaimed are supporting ongoing mining activities, and they will be reclaimed with the South Taylor Pit. Mining began in the West Pit in 1994 and mining was concluded in 2014. Currently, the West Pit is in various stages of reclamation. In 2007, CDRMS approved PR02 and the ASLM approved the associated mining plan modification which approved mining operations in the South Taylor Pit and accepted the new maximum production rate of 6 mtpy. In 2008, Colowyo opened the South Taylor Pit and this pit is the current mining location. The South Taylor Pit (**Figure 2-1**) has since produced on average approximately 2.3 mtpy of coal by utilizing truck/shovel, dragline and highwall mining techniques. On September 2, 2015, the ASLM approved a new mining plan modification for PR02. The approval included a condition that mining within leases COC-29225 and COC-29226 (i.e. the South Taylor Pit) will not exceed 4 mtpy. Based on the 2014 production rate of 2.48 mtpy, operations in the South Taylor Pit are expected to continue until approximately 2019 (dependent on production levels), with reclamation operations continuing concurrently and several years beyond 2019. All mining that has occurred at the Colowyo Coal Mine has occurred on privately owned surface parcels and coal resources as well as on BLM and State of Colorado owned surface parcels and coal

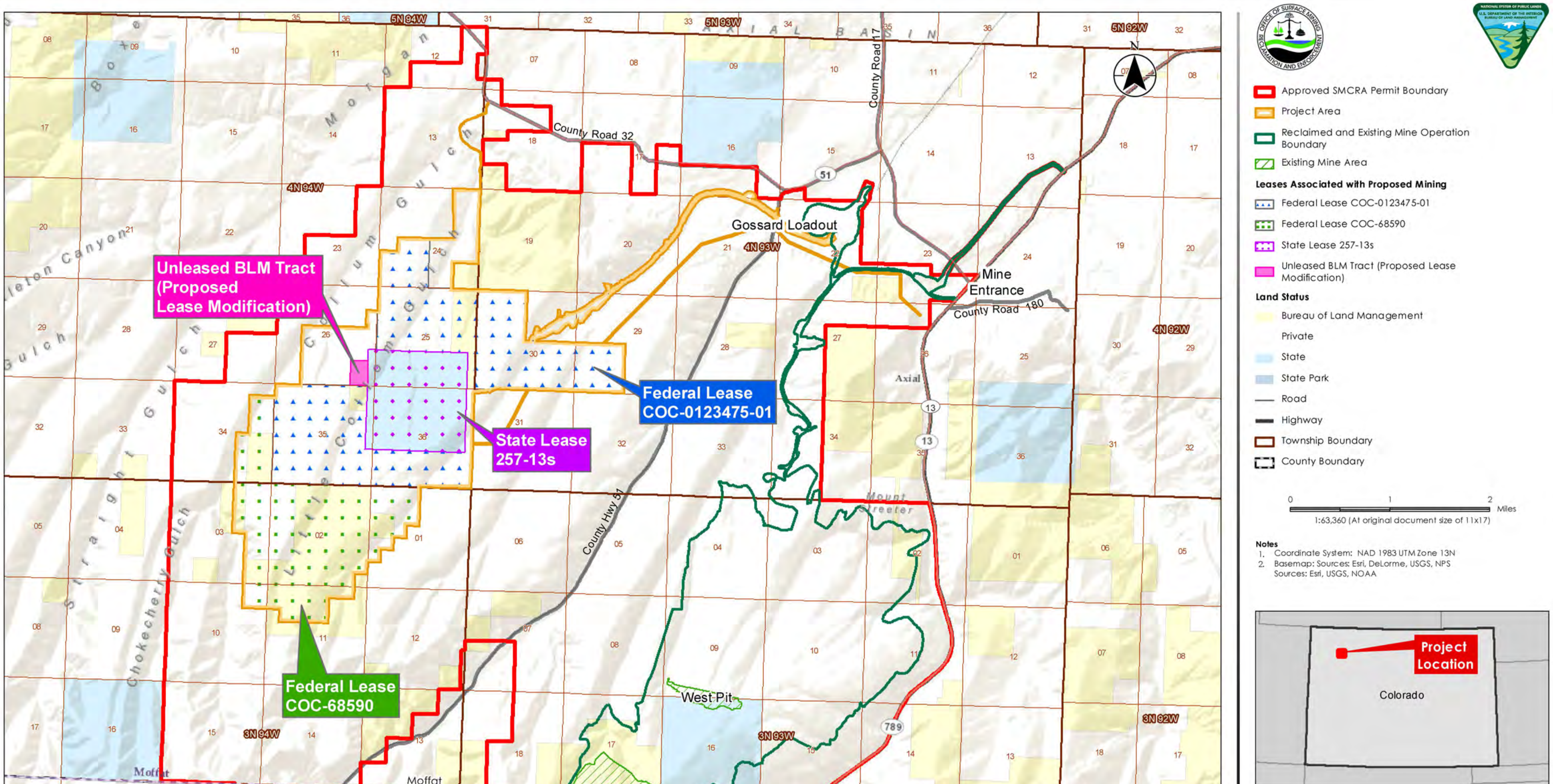
[1] *Italicized text denotes language inserted either in response to comments received on the EA (see* ***Appendix E****) or to clarify or update a topic based on new or additional information received. Each place where italicized text appears is denoted by a bar in the left hand margin.*

resources within federal leases *COC-29224,* COC-29225, COC-29226, *COC-35874, and* COD-034365, and State Lease 257-13S. The CDRMS approved SMCRA permit boundary for the current operations encompasses 12,251 acres. As of the end of the year in 2014, a total of 3,786 acres of disturbance has occurred over the life of the operation.

SMCRA, CSCMRA, and the associated federal and state regulations require that disturbance from coal mining be reclaimed as closely as possible to the AOC and to either pre-mining land uses or to approved alternate land uses. The laws and the regulations further require that reclamation efforts, including but not limited to backfilling, grading, topsoil replacement, and revegetation, on all land that is disturbed by surface mining activities shall occur as contemporaneously as practicable with mining operations. Under the laws and regulations, coal operators are required to submit a reclamation plan as part of their SMCRA permit or permit revision application that includes establishing in increments, the period of time between removal of coal and completion of backfilling and grading of the mined areas. However, coal mining is a continually evolving process over time, subject to changes in coal market demands, mining technology, geologic knowledge, and the regulatory environment. All of those change agents can result in the need for coal mine operators to apply to CDRMS and as appropriate, OSMRE, for approval to revise mining and reclamation plans and mine permits, including for changes in the timing of reclamation. It is possible that coal mine operators may request approval to re-disturb areas that have begun to be reclaimed under an existing permit approval for mine components proposed under a subsequent permit revision application. The laws and regulations and associated permitting processes recognize~~s~~ the dynamics of coal mining and the associated reclamation activities, and provide~~s~~ for approval of changes to reclamation requirements, including the reclamation timetable as appropriate. Of the *3,797* acres of land at the Colowyo Coal Mine that has already been disturbed by mining, *1,579* acres, or about *42* percent, have already been reclaimed to varying degrees.

Prior to initiating coal mining, the laws and regulations also require coal mine operators to post a bond of sufficient amount that, in the case that the coal mine operator defaults on its obligations, the CDRMS could then fully complete the required reclamation. The bonds are adjusted over time as needed to reflect changes due to CDRMS approved mining permit revisions and increases in reclamation costs due to inflation or cost increases. CDRMS releases acreage that has undergone reclamation from bond liability when the agency determines that various levels (Phase I; Phase II; Phase III) of reclamation requirements have been met, including successful revegetation. This is an incremental process since reclamation is initiated on mined areas at different CDRMS approved times and the time to achieve successful revegetation is dependent on the variables of weather and climate. To date, 980 acres have been fully released from bond liability back to the landowner by CDRMS for the Colowyo Coal Mine.

Colowyo is currently self-bonded for $80,517,829.00. As of June 8, 2016, CDRMS estimates liability for the current disturbances, including the East Pit, West Pit, South Taylor Pit, Collom Haul Road, and the current supporting infrastructure at the Colowyo Mine is $70,724,252.00. Colowyo will submit a cumulative bond schedule to CDRMS for their approval, pursuant to CDRMS Rule 3.02.1(5)(b), once the Collom mining activity is closer to initiation. This will allow Colowyo to post its surety bond in a staged development for the Collom operation, and not post the entire bond amount years ahead of surface disturbance that it would be relied upon to insure reclamation. Colowyo's self-bond once posted



Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.
2-1

Title
Project Area and Existing Operations

will ensure that reclamation for the Project is completed in accordance with the permit, State rules, and SMCRA.

Historically and currently, coal is mined from the pits and hauled to a primary crusher. Once it is sized at the primary crusher it is then hauled along the existing haul road to the north northeast approximately 3.9 miles (6.3 km) to the Gossard Loadout. Once coal arrives at the Gossard Loadout it is sized accordingly again, and then loaded on a train for shipment.

2.3 ALTERNATIVE A (PROPOSED ACTION)

2.3.1 Proposed Project Area and Mining Plan Components

The Project Area for the proposed mining plan for the Collom Permit Expansion Area is located approximately 3 miles (4.8 km) northwest of the current mining operations. The Project Area includes Federal Coal Leases COC-0123475 and COC-68590, State Lease 257-13s, and private lands owned by Colowyo which includes the proposed route for the access/haul road to the existing Gossard Loadout (**Figure 2-1**). The Project Area encompasses *4,840.9* acres and includes all or portions of:

T3N, R94W, 6th PM, Sections 1, 2, 3, 10, and 11

T4N, R94W 6th PM, Sections 24, 25, 26, 34, 35, and 36

T4N, R93W 6th PM, Sections 20, 21, 29, 30, and 31

The proposed mining plan would generally include the following components and facilities:

- Two open pits, the Collom Lite Pit and Little Collom X Pit, to access the coal seams;
- A temporary overburden stockpile area to store overburden removed prior to mining for use in backfilling open pits during reclamation;
- Mine facilities including administrative buildings (office, warehouse, machine shop, vehicle maintenance shop, coal quality lab*, washbay and tank storage areas*), a primary crusher, explosives storage area and a potable water treatment plant;
- Dispersed facilities necessary to conduct mining operations *include but are not limited to*:
  - Access and haul road along the West Fork of Jubb Creek from the Gossard loadout with no public access;
  - Temporary light use roads;
  - Temporary topsoil stockpile areas to store topsoil removed from disturbed areas for use in reclamation;
  - 69 kV power line and associated power poles within the area of mining operations that will be periodically moved as the dragline *or shovel* is moved;
  - Fiber optic line;
  - Temporary berms and screens;
  - Waterlines;
  - Ditches;
  - Construction staging areas.

- A 69 kV power line located adjacent to the Jubb Creek access/haul road that will not be moved during the life of the mine; and,
- Stormwater/sediment ponds, impoundments, and diversions.

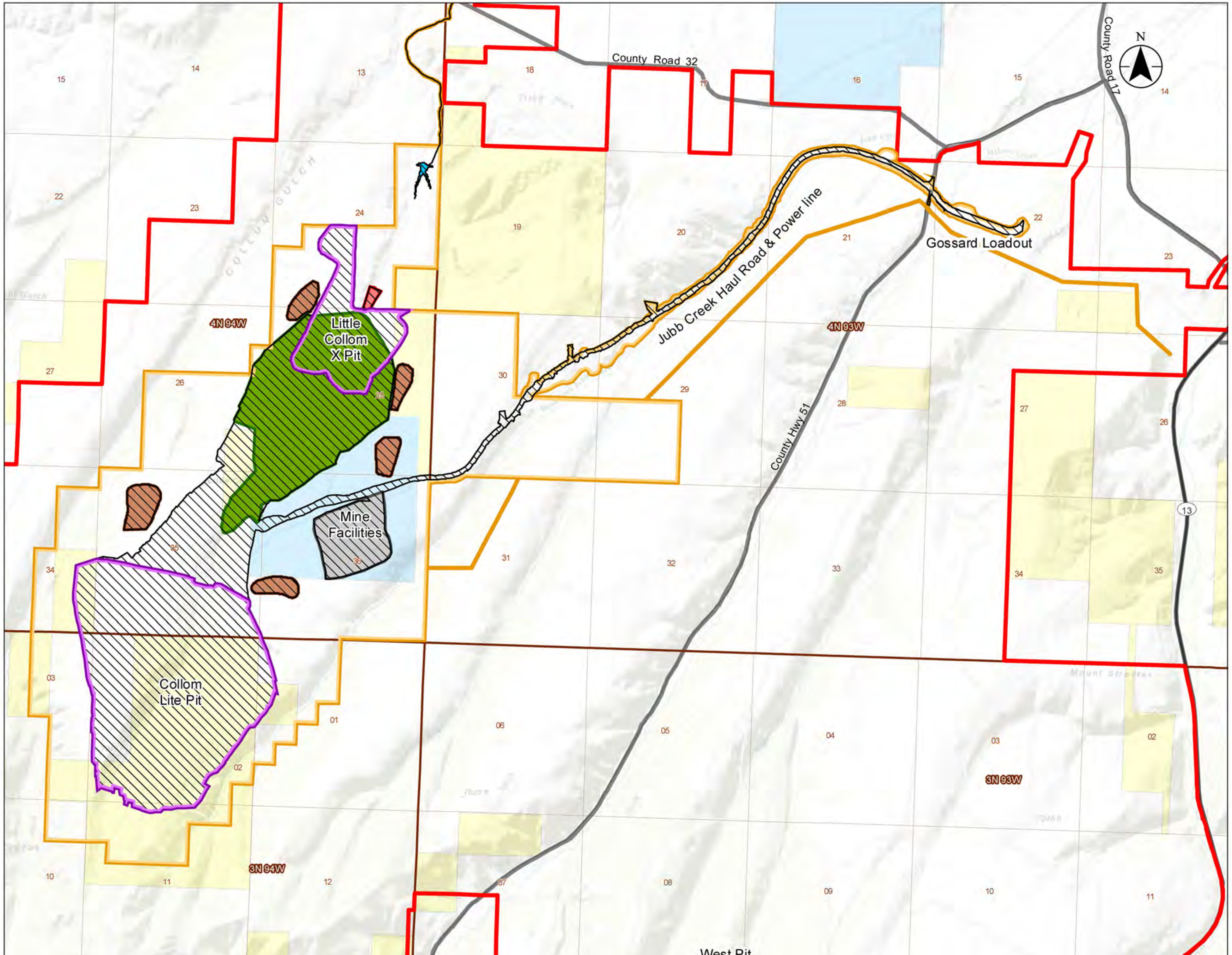
Dispersed facilities within the disturbance footprint may be moved on a regular basis based on the mining sequence and would not create additional acres of disturbance. Dispersed facilities would be sited to avoid disturbances to cultural resources, wetlands, floodplains, stream channels, and intact sagebrush stands wherever possible.

Each of these components and facilities are further described in the sections below and the location of the Project Area and the associated Project components and facilities are shown on **Figure 2-2**. The components of the Project would disturb a total of 2,090.5 acres of the Project Area as described in **Table 2.3-1**.

Table 2.3-1 Acreage Disturbed by Project Component

Project Component	Acres Disturbed
Collom Haul Road/Power Line	123.60
Mine Facilities	110.0
Little Collom X Pit	213.16
Collom Lite Pit	880.00
Temporary Overburden Stockpile	490.89
Collom Sump	4.73
Sediment Pond & Access Road	4.45
Temporary Topsoil Stockpiles	110.90
Other Areas*	278.21
Sub-Total Disturbance	2,215.94
Minus Overlap between the Little Collom X and Temporary Overburden Stockpile Area	-125.44
Total Disturbance	2,090.50

*Includes area between the Collom Lite Pit crest and the toe of the out-of-pit stockpile, and other areas adjacent to footprints listed above but included within the disturbance boundary.



N

- Temporary Overburden Stockpile
- Little Collom Sump
- Mine Facilities
- Sediment Pond
- Temporary Topsoil Stockpile
- Disturbance Area
- Approved SMCRA Permit Boundary
- Project Area
- Proposed Mine Pit Area
- Existing Mine Pit Area

Land Status

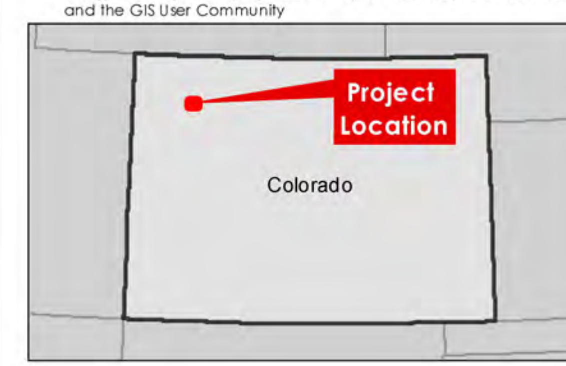
- Bureau of Land Management
- Private
- State
- Road
- Highway
- Township Boundary
- County Boundary

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. Basemap: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

2-2

Title

Alternative A (Proposed Action)

2.3.2 Mining Methods

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 general, the following mining operations sequence would be followed although some activities may occur concurrently or overlap:

- Construct sediment ponds and diversions;
- Strip and stockpile topsoil from areas to be disturbed;
- Construct the Jubb Creek access/haul road and adjacent power line;
- Construct the mine facilities;
- Begin removing overburden from the Little Collom X Pit area;
- Develop a temporary overburden stockpile in Little Collom Gulch;
- Begin removing overburden from the Collom Lite Pit area;
- Transition and overlap from mining coal in the Little Collom X Pit to mining coal in the Collom Lite Pit;
- Begin contemporaneous reclamation during mining operations;
- Complete mining of the Collom Lite Pit; and
- Complete reclamation.

While the following is a summary description of the mine operation and methods, the activities may not necessarily follow the sequence described and multiple operations may occur simultaneously.

Initially, Colowyo would strip and stockpile topsoil along the Jubb Creek haul/access road and install the associated sediment control and drainage structures. The road surface itself would then be constructed as well as the power line that would be included within the disturbance corridor. Colowyo would then construct the downstream sediment control pond and the sump near the eventual toe of the proposed temporary overburden stockpile in order to establish sediment control in the area.

Topsoil would then be stripped from the initial footprints of the Little Collom X and Collom Lite pits, the initial temporary overburden pile footprint, and the corridor for construction of the temporary overburden stockpile underdrain. Construction of the temporary overburden stockpile underdrain would commence in the valley bottom progressing upstream from the southernmost limit of the Little Collom X Pit and also progressing downstream toward the Little Collom X Sump.

Explosives would be used to fragment the overburden. Blasting would be conducted in accordance with the procedures and specifications presented in the approved SMCRA permit. Fragmented overburden would be loaded and transported to the temporary overburden stockpile or to the adjoining mined-out pit. After removal of the overburden, the coal seams would be exposed. As the coal seams are exposed, debris from the overburden would be removed using heavy equipment, then the coal seams would be drilled and shot with explosives, or broken up with heavy equipment to prepare the coal for loading and removal.

When explosives are needed, the drilling would be performed by *a blast hole drill or* an auger drill. The drill hole pattern would generally be spaced approximately 12 feet by 12 feet, though dependent upon the actual coal seam or overburden thickness. Drill holes would be loaded with either ammonium nitrate/fuel oil (ANFO) or a waterproof explosive (if the holes are wet). At the proposed maximum production rate of 5.1 mtpy, approximately 60 million pounds of explosives may be utilized per year.

Once the coal has been fragmented, a front-end loader or excavator would load the coal into haulage trucks. These haulage trucks would then transport the coal along the haul roads to the primary crusher to be located approximately 0.5 mile (0.8 km) west of the mine facilities area shown on **Figure 2-2**. The coal would then be dumped directly into the truck dump hopper, or stockpiled and fed into the hopper by front-end loaders. The primary crusher would reduce the coal to less than 8 inches in size. Following primary crushing, the coal would be discharged onto a conveyor belt that would transport the coal to a storage bin.

The coal would then be gravity discharged into highway trucks and hauled to the secondary crusher facility at the Gossard loadout on a single access/haul road along the west fork of Jubb Creek. The current vehicle fleet of 13 haul trucks would continue to be utilized for the Proposed Action. At the proposed maximum production rate of 5.1 mtpy, Colowyo estimates approximately 752,734 vehicle miles travelled (VMT) (1,211,408 km) per year by the haul trucks.

At the Gossard loadout, an existing coal stockpile would be utilized for storage of the coal hauled from the primary crusher facility *or dumped into a truck dump hopper. D*epending on the amount of coal in the active stockpile and/or the operating status of the secondary crusher, coal could be placed in temporary storage or directly discharged into the crusher's truck dump. The secondary crusher would reduce the coal to an approximate 1 1/2 inch maximum diameter or lesser size. After secondary crushing the coal would be transported on a conveyor belt and discharged through a stacking tube into the crushed coal stockpile. The coal would then be fed by gravity directly into train cars which pass through a corrugated steel tunnel located beneath the crushed coal stockpile. The existing Gossard loadout currently operates in the same manner as described above for coal transferred and mined from the South Taylor Pit and *only minor* expansion or modifications to the Gossard loadout would be needed under Alternative A.

As soon as possible after mining starts and sufficient room is available for back-filling, reclamation would begin. In general, rough backfilling would be completed by the overburden shovel, loader and trucks, bulldozers, scrapers and/or a dragline. Final grading would be performed to recreate a post mining topographic expression that would be similar to the pre-mining topography. At the completion of the final grading, topsoil would be redistributed over the regraded overburden and revegetated in accordance with Colowyo's approved reclamation plan (CDRMS 2013a).

Noxious plants would be managed in accordance with the "Weed Management Plan"*, included in the Reclamation Plan* (**Appendix A**). If insects become a problem to the point where they endanger the successful establishment of the seeded vegetation on the reclaimed area, they will also be controlled using methods suggested by the Colorado State University Extension Service.

All herbicides and pesticides utilized will be those that are approved by the appropriate state and federal governmental agencies responsible for the approval and distribution of such agents. Any application of herbicide on BLM surface requires application for and approval of an active Pesticide Use Proposal every 3 years and annual reporting of applications made.

2.3.3 Topsoil

Prior to any mining related disturbances, topsoil would be removed from planned disturbance areas and redistributed or stockpiled as necessary to satisfy the needs of the CDRMS approved reclamation timetable. Topsoil would be removed from areas primarily during the summer and fall months to allow for mining to continue advancing. Topsoil would be moved directly to areas undergoing reclamation or would be stored for future use in stockpiles. Topsoil would be stockpiled in accordance with CDRMS rules and requirements. The stockpiling or direct haulage of topsoil would continue until all pit development has progressed to its maximum extent. Topsoil stockpiles would disturb a total of approximately 111 acres. Topsoil stockpiles would be constructed with outside slopes no steeper than 3 horizontal (H):1 vertical (V). After mining and regrading operations have ceased, all stockpiled topsoil would be used to reclaim the remaining pit and other disturbance areas.

2.3.4 Temporary Overburden Stockpile

Once the topsoil is stripped and stockpiled, then the overburden would be removed and stockpiled for use in backfilling the pits. The temporary overburden stockpile that would be built would be placed in a stable location that would not exceed a 33 percent slope to ensure stability. The initial development of the temporary overburden stockpile would be anticipated to begin during the first year of mining along with the excavation of the initial box cuts and continue over approximately five years of operation. Following this approximate period, mine pit advancement would allow for placement of mined overburden into the original box cut area. Once the boxcut was completed, and mining progressed to the south, overburden material from each successive cut would be backfilled into the previously mined areas. Once enough overburden material is placed in the backfilled area development of the approved post mine topography would commence.

The temporarily stockpiled overburden would be used to fill and recontour the final pit sequence in the final years of mining activities. Stored overburden material would be used in the construction of the post mine topography. Approximately 250 million cubic yards of storage capacity for the temporary overburden stockpile would be needed with a disturbance footprint of approximately 490.9 acres.

The temporary overburden stockpile would be constructed in 50 to 100 foot lifts by use of end dump trucks, dozers, and loaders. The primary method used to build the temporary overburden stockpile would be by end dump truck supported by dozers. Initially, each lift would be dumped at angle of repose and subsequently spread by dozer. The side slope of the active dump would not exceed a 33 percent slope and would be maintained during active times of operation. The overall slope ratio of less than 3:1 (33 percent slope) would be maintained for the entire stockpile. Maintenance techniques on the temporary overburden stockpile would consist of blading of roads and ramps, along with the use of dust control during active times of operation.

Complete construction of the stockpile would be expected to take about 7 to 10 years. As such, the lower portions of the stockpile would be completed and stabilized before the top would be completed. To ensure that a water table would not develop within the stockpile during its life, a rock drain would be installed at the base of the fill along its entire length. The overburden stockpile would be confined by the valley slopes on both sides. The stockpile would remain in place until the last few years of mining and would have a life of about 15-20 years depending on production rates.

Following the completion of mining, this temporary overburden stockpile would be removed and the stored material placed back into the open pits. The area that was disturbed in conjunction with this stockpile would be reclaimed in accordance with the procedures outlined in the CDRMS approved reclamation plan (CDRMS 2013a).

2.3.5 Access and Haul Roads

A haul road would be constructed to convey mine traffic from the primary crusher to the Gossard load out facility located approximately 5.9 miles (9.5 km) northeast of the proposed pits. This haul road would be constructed to meet state specifications and standards. The proposed haul road would be constructed with a crown, and constructed upon the most stable available slope to minimize erosion. Overall grade of the road would not exceed a slope ratio of 10:1 (10 percent grade) with a horizontal alignment consistent with the existing topography. Ditches, erosion controls, and culverts would be used to minimize impacts to surrounding areas, and would be designed in such a manner to safely pass peak runoff from a 10 year, 24 hour precipitation event. The road would have an *approximate* overall width of 106 feet, with a*n approximate* 24 foot paved running surface. The road length would be about 29,000 feet (5.5 miles or 8.9 km) and would disturb approximately 123.6 acres.

Asphalt pavement specifications would be based on a*n appropriate design life and weights for* utilizing 50 ton coal haul trucks. A ditch would be installed at the toe of all cut slopes. Temporary erosion control measures would be implemented during construction to minimize sedimentation and erosion until permanent control measures can be established.

There are two main out of pit haul roads that would be built to haul overburden materials from the pits to the temporary overburden stockpile. These roads would be contained within the disturbance footprint of the temporary overburden stockpile. These roads are designated as the Central and East haul roads. A section of the East Haul Road would also be used to haul coal from the pit to the truck dump. Both roads would be designed with an overall width of 120 feet. The Central haul road would be about 6,200 feet in length and would have a maximum sustained slope of 8.3 percent. The East haul road would be about 5,200 feet in length with a maximum slope of 5.8 percent.

Drainage from the haul roads would be directed to the pit(s) wherever possible. A ditch would be installed at the toe of all cut slopes. If needed, temporary erosion control measures would be implemented during construction to minimize sedimentation and erosion until permanent control measures can be established. Such temporary and permanent control measures would include silt fences, straw bales, straw wattles, rock check dams, or other measures such as downstream sediment ponds.

Many in pit truck routes would be constructed within the Collom disturbance area. These roads would be exempt from any construction specifications, since roadways within the immediate mining pit area are not included within the Colorado Regulations definition of "road" (Rule 1.04(111)). Typical truck routes would be from 80 feet to 120 feet wide, would be built with a crown, would be ditched on either side for proper drainage, and would have berms on outside (down slope) exposures. Roads would be constructed to meet the Mine Safety and Health Administration (MSHA) standards for safety.

In order to obtain access from existing County Road 32 to the Little Collom X Sediment Pond, an existing two track road would be upgraded to a width of 12 feet for approximately 6,600 feet in length and would be designed to meet the applicable requirements of CDRMS Rule 4.03.2 for Access Roads. Use of this road would only be for routine environmental monitoring and occasional pond maintenance. Typical road use would consist of one trip per week by a light use vehicle. Routine road maintenance would consist of occasional blading and drainage control. Any out slopes created from the construction of this access road would be seeded with the seed mix listed in the approved Reclamation Plan (CDRMS 2013a).

2.3.6 Power Lines

Since Colowyo utilizes many electric-powered mining machines, electric power lines would be located in the permit area to supply electricity to the equipment. A new main power line would be a 69 kilovolt (kV) line approximately 41,000 feet (7.8 miles or 12.6 km) in length. This power line would follow and be constructed within the disturbance footprint of the Collom Haul Road shown in **Figure 2-2** and described above from the Gossard loadout area to the mine facilities, the Collom Lite Pit, the temporary overburden pile, and the Little Collom X Pit. The power line would also be constructed within the disturbance footprints of these areas and therefore would not increase the total disturbance of Alternative A. Powerlines would be constructed in accordance with *Avian Power Line Interaction Committee (APLIC) recommendations and measures described in the wildlife portion of PR04*. The major pieces of equipment that would be powered by electricity in the Collom area would be the shovel and dragline. Therefore, during the life of the mine it would be necessary to periodically move the power line loop to accommodate the changing locations of the shovel and dragline and associated advancement of the pit.

2.3.7 Mine Facilities

Development of the Collom expansion area would include the construction of new mining support facilities closer to the proposed pit locations than the existing facilities that support the current mining operation (**Figure 2-2**). The new facilities would include an office building, machine shop, warehouse and parking lot all located on state land in Section 36, T4N, R94W 6th PM. Colowyo would also construct and maintain a welding shop, tire bay, wash bay, maintenance shop, and fuel storage area in Section 36. A warehouse yard (outside fenced storage) would also be constructed and would provide storage of the larger heavy equipment parts. Additional structures in the complex would include a diesel and gasoline fueling station for both the large mobile mine equipment and the mine pickup truck fleet, a tank farm building, a potable water treatment plant, and a temporary hazardous waste storage facility. The disturbance footprint of the proposed support facilities area would be approximately 110 acres. Finally, an explosives magazines storage area and ANFO storage bins would be located west of the facilities area describe above, but within the W1/2, Section 36, T4N, R94W 6th PM.

The coal crushing and loadout facilities would include two separate facilities: (1) a new primary crusher situated within the Collom expansion area; and (2) an existing secondary crusher and train loadout at the Gossard loadout area. The new primary crusher facility would be located in the W1/2, Section 35, T4N, R94W 6th PM. This facility would include a raw coal stockpile area, a truck dump, a primary crusher, a covered conveyor, a storage bin, and a truck load-out.

The existing, secondary crusher and train load-out facility that would be utilized for the Collom coal production is known as the Gossard loadout and is located in Section 22, T4N, R93W 6th PM. Included in the Gossard loadout facility are a coal stockpile area, a truck dump, a secondary crusher, a covered conveyor, a crushed coal stockpile, and a train load-out. Construction was completed on this facility in 1979 and in 1987 a covered reclaim conveyor was added. No new facilities would be added at the Gossard loadout under Alternative A.

2.3.8 Ponds, Impoundments, Diversions

Colowyo's approved SMCRA Permit (CDRMS 2013a) includes a required Erosion and Sedimentation Control Plan to control runoff, and protect surface and ground water quality through construction of several new sedimentation structures and diversion ditches. Prior to disturbing the Project area, Colowyo would construct a downstream sediment control pond and sump near the eventual toe of the proposed temporary overburden spoil pile in order to establish sediment control in the area. A system of temporary ditches would be used to divert runoff from disturbed areas to sediment ponds. Facilities to control sediment would typically be installed in areas above (upstream) and/or below (downstream) the planned sites of disturbance. Upstream facilities, such as temporary diversion ditches and check dams upslope from the mining activities, would serve to divert normal surface runoff away from the disturbed areas. Because the Collom Lite Pit mining activities extend nearly to the top of the drainages, no upstream facilities are proposed in these areas. Upstream diversions are proposed for portions of the Little Collom X Pit. Diversion ditches located downstream would help collect runoff from disturbed areas and route it into the sedimentation ponds.

During active mining, the mining areas would aid in retaining sediment within the disturbed areas by catching water in pits, small depressions, and dozer basins, etc. This captured water and sediment would not leave the mining areas. Once reclaimed, the basins would be returned to a similar topographic profile and would drain as they did prior to mining activities (i.e., historic drainage patterns would be re-established).

Temporary diversions would be constructed to pass, at a minimum, the runoff from the precipitation event with a two-year recurrence interval. Topsoil stockpile areas constructed outside the confines of engineered sediment control structures would be required to have a perimeter ditch and berm constructed around the entire footprint of the stockpile sufficient to capture and retain any rainwater/snowmelt that would be generated from the stockpile area to preclude loss and/or contamination of the topsoil resource.

The drainage and sediment control measures presented in the approved Erosion and Sedimentation Control Plan would also provide for diversion or relocation of three ephemeral surface drainages within the permit area. No perennial streams would be diverted for the proposed project. Stream channel diversions would be constructed to pass at a minimum the runoff from the 100-year, 24-hour precipitation event. The only stream channel that would be impacted by the Collom Lite Pit is the main stream of Little Collom Gulch, an ephemeral stream draining less than 1 square mile at the proposed upstream pit boundary. It would not be diverted at the upstream boundary due to the small upstream drainage area, low runoff production potential, and the impracticality and land disturbance associated with constructing a diversion along steep canyon slopes. It would be channelized further downstream, alongside the haul road leading from the Collom Lite Pit to the proposed overburden stockpile, where it drains greater than 1 square mile. This section of the reconstructed Little Collom Gulch would be constructed to pass at a minimum the runoff from a 100-year, 24-hour precipitation event.

The eastern lobe of the Little Collom X Pit would intersect two small tributaries of Little Collom Gulch, which collectively drain approximately 1 square mile. These tributaries would be diverted around the pit in a ditch designed for the 100-year event. In addition, two small ephemeral tributary gullies located east of the proposed overburden stockpile would also be affected by operations. They would not be diverted and would instead flow into gravity sorted material under the proposed overburden stockpile.

The sump and pond would remain in place until the entire disturbance footprint area reporting to these structures is reclaimed and vegetation is adequate to control erosion to pre-mining levels. Prior to removal of the sump and pond the reclaimed area would be verified through the CDRMS Phase II bond release process. This would take a minimum of 10 years after the final reclamation block is seeded within this drainage area which is currently anticipated to occur in 2033. *Removal of these sediment control structures would occur when the bond liability for the entire watershed reporting to these structures is released under Phase II bond release. The earliest that Phase II bond release can occur is 4 years after the first seeding and in this case the first seeding is anticipated in 2033. Therefore, the earliest anticipated removal of the sump and pond structures could occur would be in approximately 2037.*

2.3.9 Water Source

Water used for dust control on haul roads may be obtained from the Wilson Reservoir located in Section 13, T4N, R93W 6th PM, from runoff water pumped from the pits or discharge from dewatering wells. Colowyo would need to acquire the appropriate permits from the Colorado State Engineer's office to do so. Colowyo is a large surface water rights owner in the Upper Yampa area (Water District 44) of Colorado Water Division 6. *Several diversions on Good Springs Creek, which is a tributary to Milk Creek, are included in the rights controlled by Colowyo.* Colowyo also owns water rights to diversions along Jubb Creek, Milk Creek, Morgan Gulch, Taylor Creek, Wilson Creek, Williams Fork, and the Yampa River (CDWR 2009). The appropriation dates on many diversions owned by Colowyo are prior to the 1890's, making them the most senior rights on their respective waterways. Therefore, any reduction in base flow could be offset by Colowyo not exercising their water rights in the amount of the reduction of the base flow, if it was determined to be necessary. The potential diminution that may result during mining is within the water rights held by Colowyo. Colowyo may need to utilize water from alternative sources, such as dewatering wells to serve as the alternative water supply. Again, the appropriate permits from the State Engineer's Office would be acquired before doing so.

2.3.10 Open Pits

The area to be mined within the Collom Lite Pit would cover an area of two long ridge lines at about 7,900 feet in elevation which is bisected by a 100 to 200 feet deep valley formed by the stream channel of Little Collom Gulch. Ultimately the Collom Lite Pit would cover 880 acres and would be approximately 650 feet deep in places. A total of 9 seams would be mined in the Collom Lite Pit. Coal production from the Collom Lite Pit would build from about 1.2 million tons in in the first year up to an average rate of 2.3 million tons per year with a maximum rate of 5.1 million tons. A total overburden/interburden volume of 498,381,818 cubic yards and coal tonnage of 79,110,000 tons is estimated to be generated and produced, respectively, from the Collom Lite Pit.

The Little Collom X Pit would be located approximately 1.5 miles (2.4 km) north of the Collom Lite Pit and 600 feet lower in elevation. Similar to the Collom Lite Pit area, the area to be mined within the Little Collom X Pit would cover an area of two long ridge lines at about 7,000 feet in elevation which is bisected by a 100 foot deep valley formed by the stream channel of Little Collom Gulch. Ultimately the Little Collom X Pit would cover approximately 213 acres and would be approximately 100 feet deep in places. There would be two seams mined in the Little Collom X Pit and mining would proceed generally in a southward direction into the hillside along the bedding plane beneath the existing coal seam. Approximately 2,550,000 tons of coal would be removed from the Little Collom X Pit.

2.3.11 Hazardous Materials

An explosives storage facility would be constructed near the western perimeter of the Plant Facilities area and would meet or exceed all MSHA and Bureau of Alcohol, Tobacco, Firearms, and Explosives (BATFE) regulations. The planned configuration of this facility (high explosive magazines area) would mirror the construction, magazine orientation, and relative configuration of the approved existing facility for the current operation. The configuration of the ammonium nitrate, emulsion, and Type V magazine storage area would be very similar to the existing structures currently in use at the existing South Taylor operation i.e. large elevated storage tanks for ammonium nitrate, a tank storing emulsion, and a designated area to park the Type V magazines-semi trailers. As these structures contain blasting materials and not high explosives, specific requirements governing their management are different and as such are separated by location from the high explosives storage area.

Oil and fuel would be stored in the mine facilities area and would be protected from spilling into other areas by earthen, concrete, or HDPE lined structures surrounding each storage facility. A state approved Spill Prevention, Containment and Control Plan for the Project is required and would be obtained prior to commencement of operations.

2.3.12 Mine Personnel

Currently 238 personnel are employed at the Colowyo Coal Mine. At an average production rate of 2.3 mtpy that number would be expected to stay fairly constant throughout the life of mining in the Collom Expansion Area. At the permitted maximum production rate of 5.1 mtpy, the number of mine personnel would be expected to grow by approximately 55-105.

2.3.13 Rail Transport

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) as is currently accomplished from the Gossard loadout. Coal is transported from the Colowyo Coal Mine to the Craig Generating station on an approximate 27 mile long rail line with the unit trains operated by Union Pacific. Approximately 18 miles of the rail road line from the mine towards Craig is owned and maintained by Colowyo. Union Pacific owns and maintains the remainder of the line to the Craig Station. At a current average production rate of 2.3 mtpy, coal is shipped on approximately 250 unit trains per year. At the proposed maximum production rate of 5.1 mtpy, approximately 554 unit trains per year would be needed to transport the coal to markets.

2.3.14 Reclamation

As soon as possible after coal mining begins and sufficient room becomes available for back-filling, reclamation would begin. Colowyo's reclamation objective is to restore the mined area to a land use capability that would be equal to or better than what existed pre-mining based on post-mine land use goals. As a required part of its PAP, Colowyo submitted and CDRMS approved a detailed Reclamation Plan (CDRMS 2013a) (see **Appendix A** of this EA). Additional reclamation details are also contained in the PAP at Rule 4 - Performance Standards, also included in **Appendix A**.

Reclamation would focus on the re-establishment of the pre-mining joint land uses: 1) rangeland (grassland for domestic livestock with wildlife benefit); and 2) fish and wildlife habitat (specifically targeting greater sage-grouse [GRSG] brood-rearing habitat, but also providing benefit to the other endemic wildlife species in the area). The re-establishment of these two land use subcomponents would be accomplished by re-establishing two primary vegetation communities: 1) grassland and 2) sagebrush steppe, respectively.

The following summarizes some of the key components of the approved Reclamation Plan:

Prior to any mining-related disturbances in the Collom Permit Expansion Area, all available topsoil would be removed from the site to be disturbed and would be redistributed to active reclamation sites or stockpiled as necessary to satisfy the needs of the reclamation timetable. As described above, once the topsoil was removed, the overburden would be removed and placed in the temporary overburden stockpile area for use in the backfilling phase of reclamation. A large, temporary out of pit stockpile of approximately 250 million cubic yards would be needed during the initial years of mining through the boxcut. Once the boxcut was completed, and mining progressed to the south, overburden material from each successive cut would be backfilled into the previously mined out areas. Once enough overburden material is placed in the backfilled area development of the approved post-mine topography would commence. At that time, overburden regrading and subsequent reclamation activities would accelerate. The backfilled mining areas would be graded to establish a stable post mine topography that blends into the undisturbed areas outside the mining limits. The final surface would approximate the overall pre-mining topography. The regrading plan would re-establish cover on 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.

Topsoil would normally be reapplied by hauling, in trucks, from topsoil stockpiles or from areas where topsoil has been removed for the advancement of the pit, to the re-graded overburden areas and then redistributed with dozers and/or scrapers. Following the re-topsoiling of an area, any necessary fertilization, surface preparation, berm development, construction of contour furrows, and seeding of the reclamation would take place.

The re-vegetation philosophy that would be utilized is a “prescribed ecological reclamation approach” (PERA) (CDRMS 2013a). The principal basis of PERA is to rebuild the foundation conditions of target vegetation communities taking into account the appropriate aspects, slopes, and topographic features of the reclaimed landscape. PERA would be applied to the Collom Permit Expansion Area to facilitate creation of a wildlife habitat favorable vegetation community (sagebrush steppe) among the more dominant grasslands necessary for livestock grazing and erosion control. Re-vegetation would specifically target livestock grazing (with wildlife benefit) and GRSG brood rearing habitat. Areas designed to target livestock grazing (and utilization by wildlife) would comprise approximately 60 percent to 80 percent of the reclaimed landscapes. These areas would principally occupy more steeply sloping ground (>10 percent slope) where the grassland community is necessary to preclude excessive erosion, especially from snowmelt. The remaining approximately 37 percent of the reclaimed landscape would exhibit flat or gently sloping surfaces (<10 percent slope) with reduced exposure to erosion. It is on the majority of these less exposed more gentle slopes whereby development of wildlife favorable habitats (sagebrush steppe) would be attempted. Establishing sagebrush communities and specifically GRSG brood-rearing habitat would be targeted on approximately 30 percent (or more) of the reclaimed landscape. Application of PERA would include management and re-vegetation specifications (e.g., shrub species in the seed mix) for use on the “grassland” targeted areas that would facilitate additional shrub establishment when climatic or other conditions are favorable. In this manner, small and/or scattered patches of additional shrub land may be established that would provide improved habitat diversity, especially for GRSG.

Areas to be re-vegetated would be seeded with mixtures approved in the reclamation seed mixture for areas targeting grassland (and erosion control), as shown in **Table 2.3-2**. The reclamation seed mixture for areas targeting sagebrush steppe (wildlife habitat – sage grouse brood rearing habitat) is shown in **Table 2.3-3**. Should one or more of the species in **Table 2.3-2** or **Table 2.3-3** be unavailable or proven ineffective and with the prior approval of CDRMS, substitutes from this list in **Table 2.3-4** would be selected in the priority stated. They would be placed in the seed mix at the rate specified in the priority stated. Planting and seeding methods would vary depending on degree of slopes, reapplied topsoil depth, new techniques, and targeted community among others; however, the same planting sequence would be used in most cases. Seeding would occur during the fall, immediately prior to the average first permanent snowfall event (typically mid to late October). If seeding could not be completed prior to seasonally permanent snowfall, additional broadcast seeding may occur in the spring as soon as ground conditions would allow. Components of the proposed seed mixes that would normally be applied via drill seeder would be applied at double the seeding rate identified on the seed mix tables for these spring season efforts and in cases where a drill seeder can't be used safely to apply the mixes.

Following seedbed preparation, grassland targeted areas would be drill seeded with a heavy duty rangeland drill with depth bands using the perennial mixture as shown on **Table 2.3-2**, Reclamation Seed Mixture - Grassland. At times, broadcast seeding may be required on steeper areas, wet areas, very rocky areas, or simply on areas that were missed by the drill seeding equipment.

For sagebrush steppe targeted areas, following seedbed preparation, these areas would be seeded with one of three scenarios using the perennial mixture as shown in **Table 2.3-3**, Reclamation Seed Mixture – Sagebrush Steppe. The first scenario would be identical to grassland targeted areas whereby a heavy duty rangeland drill with depth bands would be used for taxa to be drill seeded along with a mounted broadcaster and light tine harrow (for those taxa indicated for broadcast seeding). This process would facilitate a "one-pass" seeding procedure. The second scenario would be separation of the drill seeding and broadcast equipment that would require a "two-pass" seeding procedure. The third scenario (preferred) would involve use of equipment such as a "Trillion" cultipacker type broadcast seeder (or dribbler) to plant the entire mix indicated on **Table 2.3-3** in a single pass. Research into the use of these techniques, especially with "*tr*illion" style seeders in Wyoming and Idaho has indicated substantially elevated probabilities for success of sagebrush establishment at, or greater than, the desired densities.

Table 2.3-2 Reclamation Seed Mixture - Grassland

App.	Species	Common Name	Origin	Life Form	Seeds/lb.	Rec. PLS lbs./acre	Avg. seeds / sq. foot
Drilled							
	Agropyron dasystachyum	Thickspike wheatgrass	N	Grass	154,000	1.25	4.4
	Agropyron smithii	Western wheatgrass	N	Grass	110,000	1.50	3.8
	Agropyronspicatum inerme	Beardless bluebunch wheatgrass	N	Grass	117,000	2.00	5.4
	Agropyron trachycaulum	Slender wheatgrass	N	Grass	159,000	0.75	2.7
	Bromus marginatus	Mountain brome	N	Grass	90,000	1.00	5.1
	Elymus cinereus	Great Basin wildrye	N	Grass	130,000	0.50	1.5
	Stipa viridula	Green needlegrass	N	Grass	181,000	0.75	3.1
	Astragalus cicer	Cicer milkvetch	I	Forb	145,000	0.30	1.0
	Linum lewisii	Lewis flax	N	Forb	293,000	0.25	1.7
	Atriplex canescens	Fourwing saltbrush	N	Shrub	52,000	1.60	1.9
	Symphoricarpos rotundifollius	Mountain snowberry	N	Shrub	75,000	0.75	1.3
Subtotal =						10.65	28.87
Broadcast							
	Festuca saximontana	Rocky Mountain fescue	N	Grass	680,000	0.50	7.8
	Achillea millifolium	Western yarrow	N	Forb	2,770,000	0.10	6.4
	Penstemon strictus	Rocky Mountain penstemon	N	Forb	592,000	0.25	3.4
	Artemisia tridentata vaseyana	Mountain big sagebrush	N	Shrub	2,500,000	0.50	28.7
Subtotal =						1.35	46.26
TOTAL						12.00	75.13

The temporary out of pit overburden stockpile is expected to remain in place until the final two years of mining activities. At that time, this material would be needed to fill the final pit void. Final reclamation of the Little Collom X and Collom Lite Pits would continue through 2033. The 27.84 acre lease modification would be disturbed during the final stages of reclamation. Disturbance of those lands would be necessary for the final contour grading to tie in the natural topography with the adjacent areas to the north, east, and south that was previously covered by the temporary overburden stockpile.

Table 2.3-3 Reclamation Seed Mixture – Sagebrush Steppe

App.	Species	Common Name	Origin	Life Form	Seeds/lb.	Rec. PLS lbs./acre	Avg. seeds / sq. foot
Drilled or broadcast (with Trillion or similar)							
	Agropyron spicatum inerme	Beardless bluebunch wheatgrass	N	Grass	117,000	0.50	1.3
	Agropyron trachycaulum	Slender wheatgrass	N	Grass	159,000	0.20	0.7
	Bromus marginatus	Mountain brome	N	Grass	90,000	0.30	0.6
	Elymus cinereus	Great Basin wildrye	N	Grass	130,000	0.20	0.6
	Stipa viridula	Green needlegrass	N	Grass	181,000	0.20	0.8
	Artemisia ludoviciana	Louisiana sagewort	N	Forb	33,600	0.50	0.4
	Astragalus cicer	Cicer milkvetch	I	Forb	145,000	0.30	1.0
	Linum lewisii	Lewis flax	N	Forb	293,000	0.20	1.3
	Atriplex canescens	Fourwing saltbrush	N	Shrub	52,000	1.25	1.5
	Purshia tridentate	Bitterbrush	N	Shrub	15,000	3.00	1.0
	Rosa woodsii	Wood's rose	N	Shrub	45,300	0.50	0.5
	Symphoricarpos rotundifollius	Mountain snowberry	N	Shrub	75,000	1.00	1.7
Subtotal =						8.15	11.62
Broadcast (with Trillion or similar)							
	Poa ampla	Big bluegrass	N	Grass	882,000	0.20	4.0
	Festuca saximontana	Rocky Mountain fescue	N	Grass	680,000	0.20	3.1
	Achillea millifolium	Western yarrow	N	Forb	2,770,000	0.10	6.4
	Penstemon palmeri	Palmer penstemon	N	Forb	610,000	0.10	1.4
	Penstemon strictus	Rocky Mountain penstemon	N	Forb	592,000	0.20	2.7
	Artemisia cana	Silver sagebrush	N	Shrub	850,000	0.75	14.6
	Artemisia tridentata vaseyana	Mountain big sagebrush	N	Shrub	2,500,000	2.00	114.8
	Chrysothamnus nauseous	Rubber rabbitbrush	N	Shrub	400,000	0.30	2.8
Subtotal =						3.85	149.82
TOTAL						12.00	161.44

Table 2.3-4 Reclamation Seed Mixture – Contingency Substitutions

Priority	Species	Common Name	Origin	Life Form	Seeds/lb.	Rec. PLS lbs./acre	Avg. seeds / sq. foot
2	Agropyron spicatum	Bluebunch wheatgrass	N	Grass	140,000	0.5-2.0	1.3-5.4
1	Bromus ciliates	Nodding brome	N	Grass	80,000	0.3-1.0	0.6-1.8
4	Festuca idahoensis	Idaho fescue	N	Grass	450,000	0.2-0.5	2.1-5.2
5	Orysopsis hymenoides	Indian ricegrass	N	Grass	141,000	0.50	1.6
3	Poa sandbergii	Sandberg bluegrass	N	Grass	925,000	0.20	4.2
2	Helianthelia uniflora	Oneflower sunflower	N	Forb	103,000	0.30	0.7
1	Heliomeris multiflora	Goldeneye	N	Forb	1,055,000	0.30	7.3
3	Sanguisorba minor	Small burnet	I	Forb	55,000	0.25	0.3
4	Vicia Americana	American vetch	N	Forb	33,000	0.30	0.2
1	Artemisia cana	Silver sagebrush	N	Shrub	850,000	0.50	9.8
2	Chrysothamnus viscidiflorus	Douglas rabbitbrush	N	Shrub	782,000	0.30	5.4
4	Rhus trilobata	Skunkbrush sumac	N	Shrub	20,300	0.50	0.2
3	Symphoricarpos rotundifolius	Snowberry	N	Shrub	75,000	0.75-1.0	1.3-1.7
TOTAL						4.9-7.65	35.0-43.8

2.3.15 Life of Operation

Coal production from the Little Collom X Pit would take place in the first year and would occur concurrently with development of the Collom Lite Pit. The Little Collom X Pit is estimated to produce a coal tonnage of 2,552,000 tons, and would have an approximately four year mine life, including reclamation. Coal production from the Collom Lite Pit would build from about 1.2 million tons in the first year and increase up to a maximum of about 5.1 million tons per year in approximately five years, and would remain fairly constant thereafter. A total estimated coal tonnage of 79,110,000 tons would be mined from the Collom Lite Pit. The overall life of mining operations for the Collom project is estimated to be 19 years, with an additional two years to complete final reclamation operations, including activities such as pit backfill, final grading, placement of topsoil, and seeding. Following final reclamation, there would be a 10 year bond liability period during which the progress and success of revegetation is monitored.

Although reclamation would begin as soon as possible after the coal is removed from the mining area and sufficient room is made available for back-filling, reclamation operations would continue for some years after mining has ceased. Final reclamation of the Little Collom X and Collom Lite Pits, when seeding of the final reclamation block would be anticipated, would continue through 2033 as approved by DRMS in PR 03. However, preparation of this EA to support a decision on the mining plan modification has taken a longer period of time to complete than originally anticipated. Mining did not begin in 2012 as originally proposed under PR 03 and would be delayed by about 4 years if the mining plan modification is ultimately approved. In that case, reclamation would not be completed in 2033 as approved by DRMS in PR 03. Colowyo would need to apply to DRMS for a revision to the reclamation timeframes in PR 03. The sump and pond would be the last structures removed at the end of reclamation activities. They would remain in place until such time as the entire watershed reporting to these structures is reclaimed and granted CDRMS bond release, typically under Phase II. The removal of these structures is estimated to occur about five to seven years after the final reclamation block is seeded in the watershed reporting to these structures.

2.3.16 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, PR02 for the South Taylor/Lower Wilson Permit Expansion Area was approved in June 2007, and PR03 for the Collom Permit Expansion Area was approved in May 2013. The PAP for PR03 incorporated new design features, as well as retained design features that were included in the original permit approval and those included in the PR01 and PR02 approvals. A summary of the project design features to reduce or eliminate potential impacts to environmental resources that were incorporated in PR03, and are included in the analysis of Alternative A, are included in **Table 2.3-5.** A more detailed description of the design features is included in **Appendix B**.

Table 2.3-5 Summary of Principal Project 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 *A***).
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 *section 2.05.6 (1)* 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 CPDS Permit (Number CO-0045161 *and COR 040209* 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**).

Resource Area	Measure
Vegetation	Manage livestock 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 Colorado Parks and Wildlife (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. 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 *A***).
Fish and Wildlife	Revegetate for big game benefit/use. Construct power lines to APLIC *recommendations*. 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 *section 2.05.6 (2)* 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 GRSG brood population. Continue collaboration with CPW for GRSG studies. Implement measures required as part of the Endangered Fish Recovery Agreement with USFWS.
Cultural Resources	Features included in the Cultural Resources Protection Plan (**Appendix D**)
Visual Resources	Restore disturbed areas to AOC. For a more detailed description of design features, refer to the Reclamation Plan (**Appendix *A***).

Resource Area	Measure
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 *A***).

2.4 ALTERNATIVE B - REDUCED MINING ACTIVITY AND ADDITIONAL GREATER SAGE GROUSE PROTECTION

2.4.1 Background

NEPA and the CEQ regulations at 40 CFR 1502.14 (a) direct agencies to evaluate and develop appropriate and reasonable alternatives to proposals that involve unresolved resource conflicts. "Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant" (Question 2a, CEQ, Forty Most Asked Questions Concerning CEQ's NEPA Regulations, March 23, 1981). The BLM NEPA Handbook (BLM 2008) identifies that only those alternatives that would have lesser potential impacts than the proposed action need to be analyzed.

The objective of Alternative B would be to reduce environmental impacts while meeting the purpose and need of Alternative A. Public scoping comments identified concerns about the direct and indirect surface impacts of Alternative A on species listed under the Endangered Species Act as threatened, endangered, proposed, or candidate. Scoping comments also identified the need for OSMRE to consider an alternative that would reduce environmental impacts by limiting the amount of coal tonnage and/or acreage to be mined to lower levels than are currently proposed. Further, through internal consideration of Alternative A, OSMRE and BLM identified concerns about the potential impact of Alternative A on GRSG, and their habitat. At the request of OSMRE and BLM and in coordination with the Cooperating Agencies, Colowyo developed Alternative B as a reasonable alternative to Alternative A, which would minimize and/or reduce potential impacts to high priority GRSG habitat components such as active leks and brood rearing habitat, and incorporate GRSG habitat protection measures in addition to those already included as part of Alternative A. Alternative B would be feasible both technically and from an economic standpoint for the operation of the mine. Selection and implementation of Alternative B would require prior CDRMS approval of a revision to Colowyo's SMCRA permit under state regulations. On March 16, 2015, Colowyo submitted a PAP for PR 04 to CDRMS which would be consistent with Alternative B.

2.4.2 Reduced Mining Activity

Alternative B proposes mining only the Collom Lite Pit a modification of Alternative A that would eliminate the development and mining of the Little Collom X Pit (**Figure 2-3**). Elimination of mining at the Little Collom X Pit would reduce active mining by six months to a year, depending on the production level, and would reduce the overall life of the mine, including final reclamation operations, by approximately four years. Elimination of the Little Collom X pit would reduce the overall amount of coal produced by approximately 2,550,000 tons.

In addition, mining the Little Collom X Pit under Alternative A would disturb about 213 acres, an area which would not be disturbed under Alternative B. Further, the Little Collom X Pit under Alternative A would be located within approximately 320 feet of active GRSG lek SG 4, which had been previously reported to be inactive. The BLM LSFO RMP (page RMP-24) under Management Actions: Allowable Uses and Actions (BLM 2011), prescribes that no surface disturbing activities should occur with 0.6 mile (1.0 km) of an active lek. Elimination of mining the Little Collom X Pit under Alternative B would have the added benefit of ensuring that there would be no surface disturbance for a pit within the 0.6 mile (1.0 km) radius of a lek requirement.

The elimination of mining the Little Collom X Pit under Alternative B would also result in changes to the location of the haul roads and other access routes. Under Alternative B, as for Alternative A, there would be two main haul roads to haul overburden materials from the pit to the temporary overburden stockpile. While these roads would be contained within the disturbance footprint of the Collom Lite Pit and the temporary overburden stockpile, their location would be shifted to the south when compared with the haul road location for Alternative A. This relocation would have the associated benefit of moving mining noise and activity further away from lek SG4 than for Alternative A.

2.4.3 Greater Sage Grouse Protection Project Design Features

Alternative B would incorporate Project design features in addition to those already incorporated in Alternative A (see **Section 2.3.14** above and **Appendices A and B**), to reduce or eliminate potential impacts to GRSG and its habitat, as well as to enhance the protection of habitat and the understanding of GRSG behavior and reactions to mining operations. The additional Project design features were collaboratively developed by Tri-State, Colowyo, OSMRE, BLM, Colorado Parks and Wildlife (CPW) and USFWS during numerous meetings held at the CPW office in Meeker, Colorado, between January 23, 2014, and October

23, 2014. A final Project design feature proposal was preliminarily agreed upon on October 23, 2014, and formally agreed to in a Memorandum of Understanding (MOU) between the agencies and Tri-State. The Project design feature proposal agreed to would include the following items:

1. Design the temporary overburden stockpile to locate proposed new surface disturbances for the stockpile to a minimum distance of 0.9 mile (1.5 km) from GRSG lek SG4.

2. Donation to CPW of 4,543 acres of Priority Habitat Management Area (PHMA, formerly referred to as Preliminary Priority Habitat - PPH) (breeding and winter with some summer habitat), for GRSG in five distinct parcels currently owned and managed by Colowyo to preserve the PHMA in perpetuity.

3. Transfer of all mineral rights and grazing preference held by Colowyo on those parcels to CPW, as well as the water rights to any stock watering structures located on those parcels.

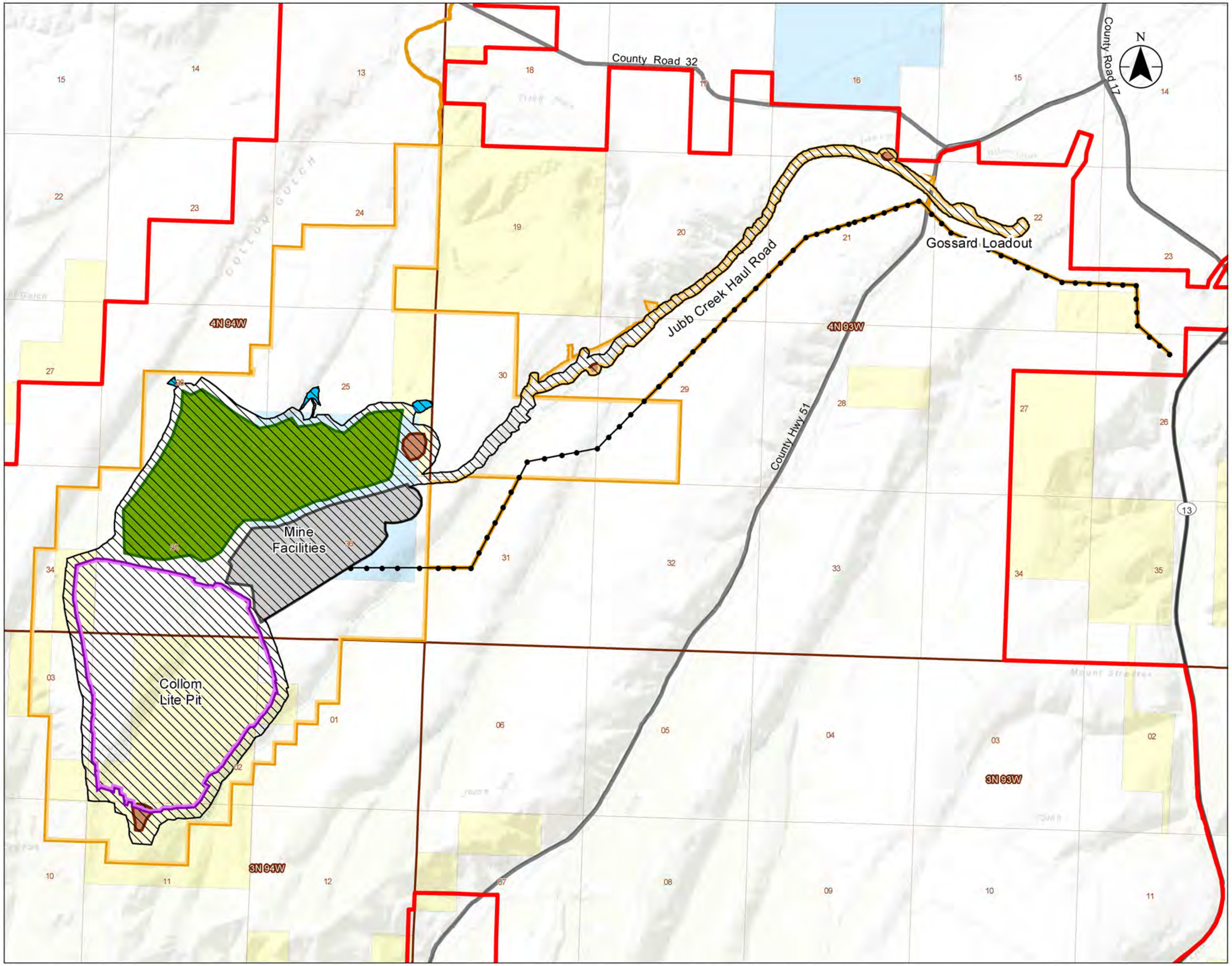
4. Monitoring of GRSG by CPW in the vicinity of the Colowyo mine funded by a donation of at least $150,000 from Tri-State to CPW.

A discussion of each facet of the GRSG Project design feature proposal is presented below.

2.4.3.1 Location of the Temporary Overburden Stockpile and Ponds

Alternative B would propose to design the temporary overburden stockpile so that it would be constructed no closer than approximately 0.9 mile (1.5 km) from the GRSG lek SG4. The 27.84 acre lease modification parcel would be an integral part of the design and placement of the temporary overburden stockpile and use of the surface of those lands would be necessary to achieve the 0.9 mile (1.5 km) surface disturbance buffer distance from GRSG lek SG-4. The parcel would lie within the northwest portion of the stockpile and would be completely covered by the stockpile. While some ancillary mining features would remain within a 1 mile (1.6 km) buffer of the lek, Colowyo would agree to construct these features outside of the lekking and early brood rearing seasons (March 15 – May 15 and May 15 – July 15, respectively). Increasing the distance between the active lek and the disturbance footprint would also take advantage of existing topographic screening in the area to further lessen impacts to GRSG.

The number and location of sediment ponds and their associated access would also be different for Alternative B in comparison to Alternative A and for the benefit of GRSG. Alternative B would include three sediment ponds along the northern edge of the temporary overburden stockpile (**Figure 2-3**). Access roads would be constructed to access the Section 26 Sediment pond, the Section 30 Sediment pond, and the Section 25 Sediment pond within the Alternative B disturbance boundary. These access roads would be designed to meet the applicable portions of CDRMS Rule 4.03.2 for Access Roads. Typical road use would consist of one trip per week by a light use vehicle at slow speeds to conduct environmental monitoring. The Section 26 and Section 30 sediment ponds would be located more than 1 mile (1.6 km) from GRSG lek SG4 and the Section 25 sediment pond would be located approximately 0.7 mile (1.1 km) from the lek. By comparison, the Collom Sump for Alternative A (**Figures 2-1 and 2-4**)



- Powerline
- Temporary Overburden Stockpile
- Mine Facilities
- Sediment Pond
- Temporary Topsoil Stockpile
- Disturbance Area
- Approved SMCRA Permit Boundary
- Project Area
- Proposed Mine Pit Area

Land Status

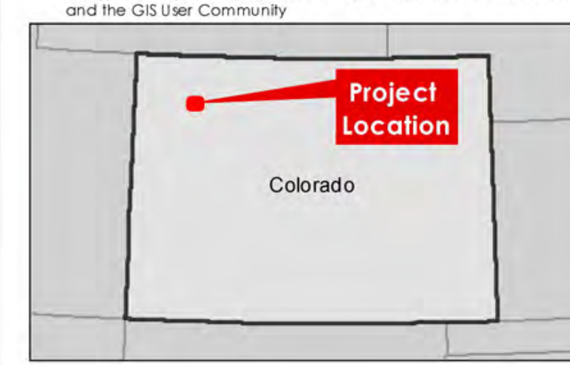
- Bureau of Land Management
- Private
- State
- Road
- Highway
- Township Boundary
- County Boundary

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. Basemap: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



Project Location

Rio Blanco & Moffat Counties
Colorado

Project

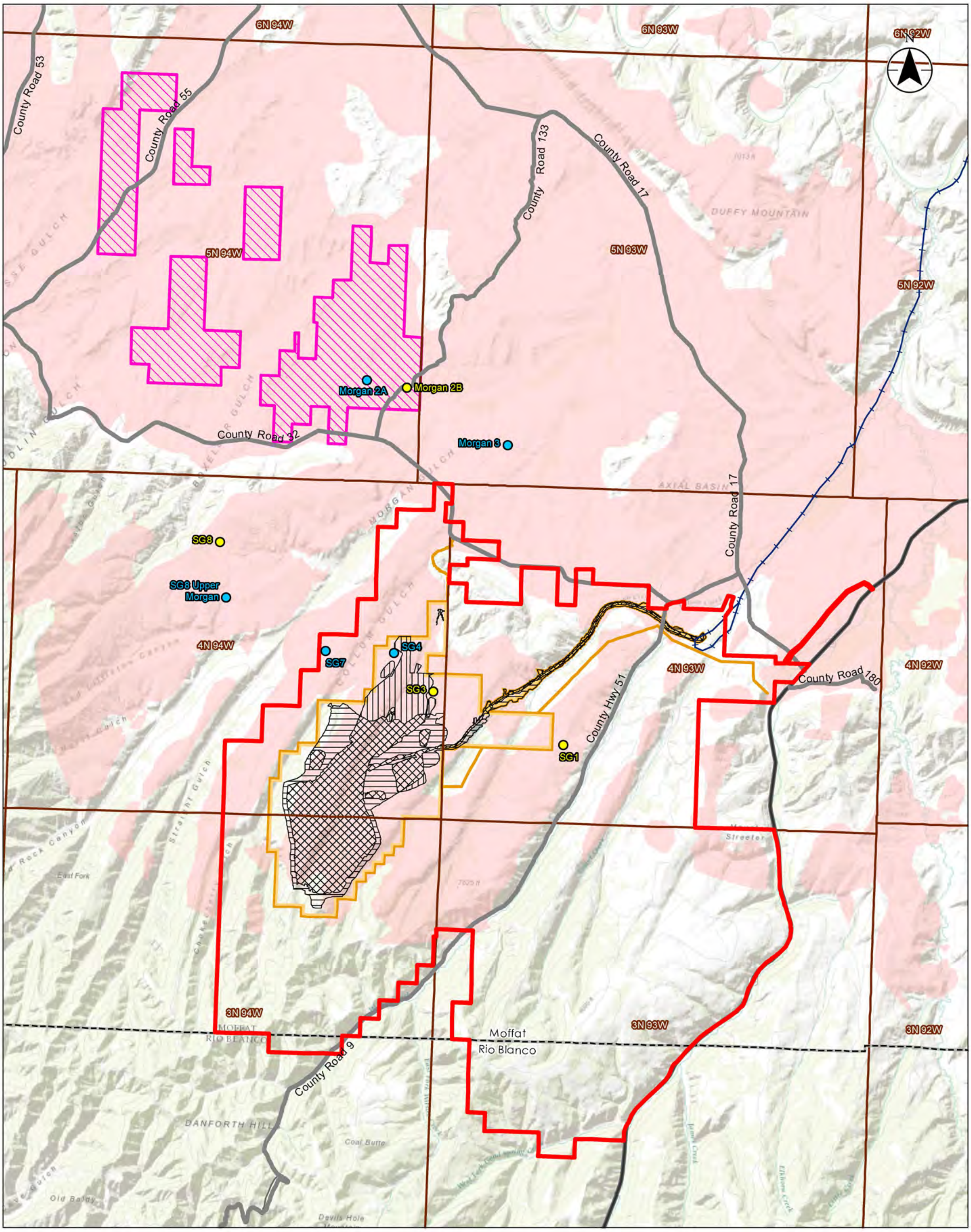
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

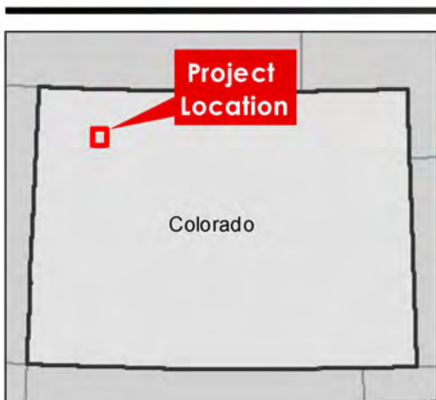
Figure No.

2-3

Title

Alternative B (Reduced Mining)





Sage-Grouse Lek - Active

Sage-Grouse Lek - Inactive

Proposed Greater Sage-Grouse Habitat Donation Land

Priority Habitat Management Area (PHMA)

Disturbance

Alternative A Disturbance Only

Alternative B Disturbance Only

Both Alternative A and Alternative B Disturbance

Approved SMCRA Permit Boundary

Project Area

Railroad

County Road

County Boundary

Township Boundary

0 1 2 miles

1:88,704 (At Original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance

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Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

2-4

Title

Greater Sage-Grouse Mitigation

would be located only 1,750 feet (0.33 mile or 0.5 km) from lek SG4 and the northern sediment pond would be 3,630 feet (0.68 mile or 1.1 km) from the lek.

2.4.3.2 Land Donation

During the series of meetings between the agencies, Tri-State and Colowyo, it was determined that of the 2,636.73 acres of total disturbance under Alternative B, there would potentially be direct impacts to approximately 2,133 acres of mapped PHMA for GRSG from the proposed mining operations. The remaining 503.73 acres of Alternative B's disturbance footprint would directly impact *GHMA* for GRSG. In addition to the direct impacts to PHMA, consultation with CPW, BLM and USFWS biologists determined that indirect impacts would potentially occur up to 900 meters (2,953 feet) from the edge of disturbance. This distance was determined using several years of monitoring data from the Axial Basin where the currently operating mine occurs and a number of years of recorded GRSG locations near the existing mining operations obtained through radio telemetry by CPW in cooperation with Colowyo. Based on the 900 meter distance, it was determined that there would be 2,180 acres of PHMA potentially indirectly impacted. In total, there would be 4,313 acres of PHMA potentially impacted both directly and indirectly by Alternative B. To offset both the direct and indirect potential impacts to GRSG PHMA, Tri-State would donate a total of 4,543 acres of land within PHMA but outside of the permitted mine boundary in five non-contiguous parcels to CPW (**Figure 2-4**). This land would be managed by CPW for the preservation and maintenance of GRSG habitat in the Axial Basin in perpetuity. The five parcels are located between 2 and 5 miles (3.2 to 8.1 km) north of the mine boundary (**Figure 2-4**). A Land Donation Agreement would be signed between Tri-State and CPW and would include details for the land donation, when the donation would occur, and a legal description of the area.

2.4.3.3 Grazing, Water, and Mineral Rights

In addition to donation of the 4,543 acres of land to CPW, Tri-State and Colowyo would be transferring their BLM grazing preference to CPW. CPW could then lease the base property and with BLM approval, the grazing preference could be transferred to that qualified applicant. CPW has indicated that they would lease their grazing preference to a qualified applicant to allow for continued grazing in those areas. CPW would also lease the base property to the qualified applicant and the BLM grazing permit would remain in the qualified applicant's name.

Tri-State and Colowyo would also transfer all mineral rights they own associated with the donated lands to CPW, as well as any water rights that Tri-State holds for any stock watering facilities on those parcels. Control of these rights by CPW would allow for greater management flexibility by CPW for the ultimate benefit to GRSG.

2.4.3.4 GRSG Monitoring by CPW Funded by Tri-State

CPW would conduct a GRSG monitoring program near the Project Area, funded by a $150,000 donation from Tri-State, to determine the impacts on GRSG from the initiation of coal mining in an area that previously has had few impacts from land disturbance. During the series of meetings with the agencies, it was identified that there has been no previous detailed monitoring of the impacts from coal mining on GRSG populations from prior to initial surface disturbance and throughout all phases of mine development and mining. It is intended that the donation of the $150,000 would be used to monitor potential changes in GRSG habitat use from the initiation of mining in an area that previously has had few impacts from land disturbance.

BLM reviewed the Northwest Colorado GRSG Resource Management Plan Amendment (RMPA) and indicated that the conservation measures proposed in the MOU are in agreement with the requirements of the RMPA.

2.4.4 Other Mine Components and Associated Project Design Features

Alternative B is a modification of Alternative A and incorporates most of the mine components and Project design features of Alternative A. This section identifies those mine components and associated Project design features that were also included in Alternative A, but that would be changed under Alternative B, other than the temporary overburden stockpile and sediment ponds described in **Sections 2.4.3** and **2.4.3.1** above.

2.4.4.1 Collom Haul Road

The length of the Collom Haul Road for both Alternatives would be the same, about 29,000 feet (5.5 miles or 8.9 km). However, in order to effectively address engineering design considerations for known, and potential unknown, terrain and geotechnical issues, cut and fill slopes, and allow a reasonable contingency for unanticipated construction issues related to these factors, the disturbance width for Alternative B would be approximately 100 feet wider on both sides of the center alignment for than for Alternative A. This would allow for construction and disturbance within this boundary but not all areas within this boundary would be disturbed. This additional contingency disturbance width was not considered in the previous design of the haul road under Alternative A (i.e. PR 03). All reasonable efforts would be made to construct the haul road within this corridor. However, if unanticipated geotechnical conditions reasonably preclude construction in the described location, minor adjustments to the alignment may be made, but there would not be an increase in the surface disturbance for the haul road construction. If the entire width of the corridor were disturbed, this would result in disturbing approximately 202 acres for construction of the Collom Haul Road under Alternative B, approximately 78 acres more than under Alternative A. Furthermore, once construction of the Collom Haul Road is complete, the surface disturbance created by the construction, but not part of the road itself, would be immediately reclaimed with the approved CDRMS seed mixture during the same construction season.

The additional disturbance width for the Collom Haul Road under Alternative B, when compared with Alternative A, would result in disturbance within 100' of both Jubb Creek and Wilson Creek. Rule 4.05.18 of the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining (CDRMS 2005) requires CDRMS approval for disturbance within 100' of a perennial, intermittent or ephemeral stream with a drainage area of greater than one square mile. No stream buffer zones were identified for either Wilson Creek or Jubb Creek under Alternative A because of the narrower disturbance width. Colowyo has identified stream buffer zones along both Wilson Creek and Jubb Creek extending out 100' on either side of the streams. The Collom Haul Road would cross both Wilson Creek and Jubb Creek and would also parallel Jubb Creek, where there would be a 140 foot section of the haul road where disturbance would be within 100 feet of the stream. The following design features are incorporated into the PAP for PR04, and therefore Alternative B, and would be employed prior to any disturbance occurring within these areas:

- For the stream crossings, during construction, Colowyo would install a bottomless culvert *(Wilson Creek crossing only)*, and would employ proper best management practices (BMPs) during the construction phase in accordance with Colowyo's *construction* Stormwater *Construction M*anagement *P*lan, Section 401 certification, and US Army Corps of Engineers 404 permit. Once construction of the road is completed, all surface water runoff from the Collom Haul Road would be directed to BMPs prior to being released.
- During construction of the Collom Haul Road, ditches, erosion controls, and culverts would be used to minimize impacts to surrounding areas and would be designed in such a manner to safely pass peak runoff from a 10 year, 24-hour precipitation event. Also during construction of the road, the field engineer would determine the need for erosion control measures *and update the Stormwater Construction Management Plan accordingly*. Such temporary and permanent control measures would include silt fences, straw bales, straw wattles, rock check dams, or other measures such as downstream sediment ponds.
- Once the road construction is complete, any areas that can be reclaimed would be completed as soon as possible.

2.4.4.2 Power Line

*According to PR04 as submitted to CDRMS, for Alternative B, the proposed route for the power line supplying electricity to the mine facilities and draglines is different from its path as identified in Alternative A along the Collom haul road. The proposed route is identified in **Figure 2-3**. The power line under Alternative B would be approximately 6.4 miles (10.3 km) in length and would travel from the existing Axial Basin substation near the mine entrance and would be routed west to the Alternative B disturbance footprint. In general, the placement of the power line would be adjacent to, and/or south of the Collom Haul Road. The power line would be constructed within a 30 foot corridor, all disturbances would be contained within that corridor, and if all of the corridor were disturbed, a maximum of 23.4 acres would be disturbed. The maximum surface disturbance that may be created by the power line under this alternative is accounted for in the mitigation land being conveyed to the CPW for Greater Sage Grouse mitigation. Further reconfiguration of the power line may be required after additional analysis of the topographical and engineering constraints of the area along the haul road. If the power line cannot be constructed as proposed in PR04, Colowyo will apply for a revision to CDRMS.*

Colowyo would construct the line with the following GRSG mitigation: 1) The power line would be sited outside of mapped GRSG PHMA to the extent possible; 2) A brush hog would be used to clear vegetation rather than blading in order to retain the seed bank and retain rootstock in those areas; 3) To the extent possible, the power line would be constructed outside of the sensitive seasons of the year for GRSG; and, 4) constructed in accordance with avian protection *recommendations*.

2.4.4.3 Water Pipeline from Wilson Reservoir to Collom

Colowyo would require raw water for the development of the Collom Mine *for both Alternative A and B*. To provide *the* water *for either alternative*, Colowyo would construct a new, roughly eight mile long water pipeline from Colowyo's Wilson Reservoir, located about two miles east-northeast of the Gossard Loadout, to the Collom Mine area. Colowyo would also need to construct one or more pumping stations. The new pipeline would be constructed within the existing CDRMS approved pipeline corridor from the Wilson Reservoir to near the Gossard Loadout. This existing approved corridor has already been disturbed for the construction of pipelines previously approved by CDRMS that are currently buried in the corridor. For this portion of the pipeline route, the new pipeline would be constructed parallel to the existing pipelines. From approximately the Gossard Loadout, the new pipeline would generally and to the extent feasible, follow the proposed route and disturbance area of the Collom Haul Road to the Collom Facilities Area (**Figure 2-3**). However, due to engineering and/or geologic factors, it may be necessary to construct portions of the pipeline and/or pumping station(s) outside the delineated Collom Haul road disturbance area.

While the exact engineering design and construction methodology of the pipeline is not known at this time, it would meet all required and needed engineering protocols and criteria. In general, for the majority of the proposed route, the pipeline would be buried to an appropriate depth in a trench. Other engineering methodologies, such as boring, would be utilized as and where needed and approved by CDRMS (e.g. road and stream crossings). One or more pumping stations, including ancillary support equipment and structures, would be placed in locations at the Wilson Reservoir and somewhere along the Collom Haul road portion of the route as required. The amount of surface disturbed by these installations would be minimized to the extent practical. The total amount of surface disturbed for the pipeline and pump station(s) combined along the Collom Haul road portion of the route would be included as part of, and not exceed, the ten percent overage for ancillary facilities acreage (239.7 acres total) identified in **Table 2.4-1**. The pipeline would be constructed in advance of when it would be needed to supply water to the Collom mining operation in as expedient a manner as possible, adhering to all safety criteria and proper engineering protocols. To the extent possible, pipeline construction timing only for that section of pipeline adjacent to Sage Grouse Lek "Gossard/SG12" would take place outside the GRSG lekking season (mid-March through May).

2.4.5 Alternative B Disturbance Footprint

Under this Alternative, there would be a total disturbance footprint of 2,636.7 acres. **Table 2.4-1** depicts the disturbance from each Project component. Compared to Alternative A, this is an increase of 546.2 acres (26.1 percent). **Table 2.4-2** shows the differences in the disturbance acreages between the Alternative A and Alternative B.

Table 2.4-1 Acreage Disturbed under Alternative B by Project Component

Project Component	Acres Disturbed (Alternative B)
Collom Haul Road	202.32
Collom Lite Pit	880.00
Temporary Overburden Stockpile	629.35
Sediment Pond & Access Road	7.70
Temporary Topsoil Stockpiles	47.40
Other disturbance for equipment accesses, facilities, haul roads, ditches, and other sediment control features	630.26
Sub-Total Disturbance	2,397.03
10 percent overage for ancillary facilities (power line, fiber optics, ponds, ditches, topsoil piles)	239.70
Total Disturbance	2,636.73

Table 2.4-2 Comparison of Disturbance Acreages

Project Component	Alternative A	Alternative B	Difference for Alt B
Collom Haul Road/Power Line[1]	123.60	202.32	+78.72
Collom Lite Pit	880.00	880.00	0
Little Collom X Pit	213.16	0	(213.16)
Temporary Overburden Stockpile	490.89	629.35	138.46
Sediment Pond and access road	4.45	7.70	+3.25
Temporary Topsoil Stockpile	110.90	47.40	(63.50)
Mine Facilities[2]	110.00	0	(110.00)
Collom Sump	4.73	0	(4.73)
Other Areas[3]	278.21	630.26	352.05
Minus Overlap between the Little Collom X Pit and temporary overburden stockpile	-125.44	NA	0
10 percent overage for ancillary facilities [4]	0	239.70	239.70
Total	2090.50	2,636.73	+546.23

1. Under Alternative B, the power line would be placed in a separate corridor.
2. Under Alternative B, mine facilities are included in the "Other Areas"
3. "Other Areas" for Alternative A includes the area between the Collom Lite Pit and the toe of the temporary overburden stockpile, and other areas adjacent to other category disturbance footprints. For Alternative B, Other Areas include disturbance for equipment access, facilities, secondary haul roads, ditches, and sediment control features including areas around the Collom Lite Pit.
4. The 10 percent overage is included to allow Colowyo the ability to adjust the size and/or number of these features, if needed, based on geological or engineering constraints encountered during construction.

There are several factors that contribute to the larger surface disturbance area. Below is a discussion of five key factors that account for the majority of the increase:

A) The design and layout of the temporary overburden stockpile would change substantially from the design and layout under Alternative A. Under Alternative A, the temporary overburden stockpile would be located further north and closer to the Little Collom X Pit, within the Little Collom Gulch. By placing material in the gulch it allows for material to be placed in a thicker cross section over a smaller surface area. Under Alternative B, the Little Collom X Pit is not developed and the temporary overburden stockpile is relocated further south closer to the Collom Lite Pit to create a greater distance from the GRSG lek SG4. Alternative B does not provide as much void space in the gulch to hold material; therefore, it is necessary to increase the footprint of the stockpile to hold the amount of material that would be necessary for mining. Alternative B would still place material into Little Collom Gulch, but material would also be placed on the flatter topography to the east and west of Little Collom Gulch with sloping faces on its flanks, which increase the surface footprint. The resulting stockpile footprint for Alternative B, while containing a smaller volume of material, would be approximately 139 acres larger than that for Alternative A because it would not be located in a geomorphic depression as the stockpile for Alternative A.

B) The disturbance area associated with the Collom Lite Pit under Alternative B, but outside the actual 880 acre mined area, includes approximately 157 additional acres of disturbance when compared with Alternative A. The additional disturbance is necessary to make adjustments to surface water diversion ditches and access roads that need to be redesigned and relocated to support Alternative B or were not previously included in Alternative A. Alternative B includes additional sediment ponds due to the reconfiguration of the temporary overburden stockpile that were not necessary under Alternative A. The diversion ditch structures are required under the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining to ensure compliance with applicable rules related to surface water runoff from disturbed mining areas. To ensure compliance with the applicable rule and transport water to the appropriate sediment control structures from mining areas, ditch locations and alignments had to be redesigned to ensure that redirected surface water runoff went to the new sediment ponds. Under Alternative A the Little Collom X access road (1.8 acres of disturbance) would have provided access for environmental monitoring and cleanout activities related to the Little Collom X Sediment Pond. Due to the revised configuration of the temporary overburden stockpile and the necessity to have additional sediment control structures, additional roads are required to access these structures for routine environmental monitoring and maintenance. Alternative B also adds access roads around the crest of the Collom Lite Pit, when compared with Alternative A, which would be necessary to support mining activities throughout the life of the mine. The size of the actual mined area for the Collom Lite Pit in Alternative B would not increase over the actual size of the Collom Lite Pit in Alternative A.

C) Alternative B includes approximately 124 additional acres inside the surface disturbance boundary for the facilities identified in Alternative A and for additional facilities including a water pipeline, coal stockpiles, explosives magazine storage, fuel islands, sediment control structures, holding ponds, and ANFO storage. The siting of the additional facilities should not disturb all of the additional acres, but the disturbance boundary could not be further limited and still provide for adequate siting of these facilities should unanticipated field conditions during construction require these facilities to be relocated within the additional disturbance area in Alternative B.

D) The Collom Haul Road in Alternative B would be modified from Alternative A to more effectively accommodate the terrain and rock outcroppings along the route and the required cuts and fills that would be necessary during construction. In addition, in order to accommodate unanticipated design changes due to geology and unforeseen engineering constraints, the proposed disturbance width for the construction of the road would be increased by approximately 100 feet along both sides of the alignment when compared to Alternative A. This increased width would add approximately 79 acres to the disturbance area for Alternative B when compared to Alternative A. Once construction of the haul road is complete, the majority of these additional acres would be reclaimed immediately during the same construction season.

E) The proposed route for the power line for Alternative B would be located south of the Collom Haul Road instead of adjacent to it as it is defined in Alternative A. The power line route would be approximately 6.4 miles (10.3 km) long and would be contained within a 30-foot wide disturbance area. When compared to Alternative A, the Alternative B power line route would add approximately 23.4 acres of surface disturbance.

2.4.6 Summary Comparison between Alternative A and Alternative B

In summary, when compared with Alternative A, Alternative B proposes mining only the Collom Lite Pit (**Figure 2-3**), a modification of Alternative A that would eliminate the development and mining of the Little Collom X Pit. In comparison with Alternative A, Alternative B would also result in the following: 1) reduce the amount of overburden needing storage in the temporary overburden stockpile by 43,600,000 cubic yards or about 28 percent; 2) re-design and relocate the footprint of the temporary overburden stockpile further south and upslope in Collom Gulch as shown in **Figure 2-3**, to maintain a no surface disturbance distance of 3,820 feet from the perimeter of GRSG lek SG4; 3) maintain a no surface activity distance of 1 mile (1.6 km) from the GRSG lek SG4 during the lekking and early brood rearing season; 4) relocate the power line alignment away from the Collom Haul Road further to the south and further from GRSG lek SG4; 5) mine approximately 2,550,000 tons less coal thereby reducing the overall mine life, including final reclamation operations, by about four years; 6) reduce the amount of explosives used by 14,754,325 lbs.; and 7) reduce water usage by approximately 120,000,000 gallons. **Table 2.4-3** shows a comparison of the acres disturbed by each Alternative for the different combinations of surface and coal ownership.

Table 2.4-3 Comparison of Acres Disturbed By Surface and Coal Ownership

Surface and Coal Ownership	Acres Disturbed under Alternative A	Acres Disturbed under Alternative B	Acreage Difference for Alternative B
Federal surface and federal coal	592.6	706.9	+114.3
Private surface and federal coal	1,113.6	1,261.9	+148.3
Private surface and private coal	47.1	104.2	+57.1
State surface and state coal	337.2	563.7	+226.5
Total	2,090.5	2,636.7	+546.2

Overall, Alternative B would disturb about 26 percent more acreage (546.2 acres) than Alternative A due to the nature of the terrain over which the temporary topsoil stockpile would be placed. Under Alternative A, that stockpile would be placed primarily within Little Collom Gulch. Under Alternative B, the stockpile would be spread over a wider area of flatter terrain when compared with Alternative A. Alternative B would also disturb more federally owned surface over federally owned coal and privately owned surface over federally owned coal than Alternative A.

All other mining aspects of Alternative B would be the same as described above for Alternative A.

2.5 ALTERNATIVE C – NO ACTION ALTERNATIVE

Under this alternative, neither the proposed mining plan modification nor the proposed lease modification would be approved, federal coal reserves in the Collom Expansion Area would not be recovered, and production at the Colowyo Mine could cease around 2019 or before, once coal reserves in the South Taylor Pit are mined out. Final reclamation operations would continue after mining ceased. Under the No Action Alternative, there would be no surface disturbance, removal of coal, air quality impacts or any other effects associated with mining or reclamation operations in the Collom Permit Expansion Area.

2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

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

- 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; and,
- it would have substantially similar effects to an alternative that is analyzed.

2.6.1 Underground Mining Alternative

An alternative to require Colowyo to utilize underground mining methods to extract the coal was considered by OSMRE and eliminated from detailed analysis for the following reasons. CDRMS has approved a SMCRA permit for this project utilizing surface mining techniques; underground mining is inconsistent with the approved permit. The scope of the Purpose and Need for this EA is predicated upon review of a surface mining plan in accordance with the approved SMCRA Permit. An Underground Mining Alternative would be inconsistent with the scope of the Purpose and Need for this action.

Further, the coal resource at Colowyo is characterized by a large number of relatively thin seams, spread over a fairly long vertical span. Under these conditions, surface mining achieves a substantially higher recovery of coal, and is therefore materially better at attaining the objectives of the MLA and related regulations for achieving maximum economic recovery and minimizing waste of the coal resource.

This alternative is also economically infeasible at current permitted production rates, and the economics of initiating an underground longwall mining operation in the Collom Expansion Area are not cost effective. The facilities and equipment needed for underground mining are different from surface mining. Since 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. All new surface facilities would need to be constructed such as, 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 miner, several continuous miners, shuttle cars and a roof bolter.

In addition, approval of a new SMCRA permit application by CDRMS 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 scope of the Purpose and Need for this EA and in addition, the economic burden to shift to underground mining would be unreasonable.

2.6.2 Air Quality Mitigation Alternatives

One commenter 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 actual 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 action alternatives considered here, do not meet the regulatory definition of a connected action (40 CFR 1508.25 (a) 1.), 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 Alternative C (No Action) 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.

Requiring additional emission control measures at the Craig Generating Station and nearby oil and gas operations would be outside the scope of OSMRE's authority. 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 Colorado Department of Health and Environment (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.

CHAPTER 3 AFFECTED ENVIRONMENT[1]

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 impact, or where analysis is necessary to determine the significance of the impact. **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 in **Section 3.2**.
PI	Air and Climate Resources	See discussion in **Section 3.3**.
PI	Geology and Minerals	See discussion in **Section 3.4**.
PI	Water Resources	See discussion in **Section 3.5**.
PI	Vegetation (includes invasive species and upland vegetation)	See discussion in **Section 3.6**.
PI	Wetlands and Riparian Zones	See discussion in **Section 3.7**.
PI	Fish and Wildlife Resources	See discussion in **Section 3.8**.
PI	Special Status Species (includes animal and plant species)	See discussion in **Section 3.9**.
PI	Cultural and Historic Resources	See discussion in **Section 3.10**.
PI	American Indian Concerns	See discussion in **Section 3.11**.
PI	Socioeconomics	See discussion in **Section 3.12**.
NP	Environmental Justice	See discussion in **Section 3.13**.

[1] *Italicized text denotes language inserted either in response to comments received on the EA (see **Appendix E**) or to clarify or update a topic based on new or additional information received. Each place where italicized text appears is denoted by a bar in the left hand margin.*

Determination[1]	Resource	Rationale for Determination
PI	Visual Resources	See discussion in **Section 3.14**.
PI	Recreation	See discussion in **Section 3.15**.
PI	Paleontology	See discussion in **Section 3.16**.
PI	Access and Transportation	See discussion in **Section 3.17**.
PI	Solid or Hazardous Waste	See discussion in **Section 3.18**.
PI	Noise	See discussion in **Section 3.19**.
PI	Livestock Grazing	See discussion in **Section 3.20**.
PI	Soils	See discussion in **Section 3.21**.
NP	Prime Farmlands	See discussion in **Section 3.22**.
NP	Alluvial Valley Floors	See discussion in **Section 3.23**.
PI	Public Involvement	See discussion in **Chapter 6**.
NP	Wild Horses	No wild horse Herd Management Areas are located within or near the Project Area.
NP	Floodplains	No FEMA[2]-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	None of the alternatives would impact existing realty authorizations. There are no proposed changes to land tenure in the Project Area.
NP	Special Use Authorization	As the mine permit area is closed to the general public, no special use authorizations are available in the Project Area.
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.
[2] Federal Emergency Management Agency

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

The climate is semi-arid shrub steppe (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 Gambel oak (*Quercus gambelii*), snowberry (*Symphoricarpos albus*), serviceberry (*Amelanchier* sp.), mountain mahogany (*Cercocarpus ledifolius*), pinyon (*Pinus monophylla*), juniper (*Juniperus monosperma*), and aspen (*Populus tremuloidies*). 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. Wetlands occur along the fringes of both Wilson and Jubb creeks and their tributaries (BLM 2006).

3.2 TOPOGRAPHY

The Project Area is located on the southern edge of the Yampa River Basin northwest of the Danforth Hills. Elevations range from approximately 8,100 feet above mean sea level (amsl) on the southern end of the Project Area to 6,900 feet on the north. The area consists of gently sloping interfluvial ridges divided by deeply entrenched gulches and drainage valleys. Major drainages include Jubb Creek, *as well as* various forks of the Collom Gulch and Little Collom Gulch. All drainages flow northeast and ultimately to the Yampa River. The ridge surfaces are characterized by shallow tan to gray-brown silts or silty loams locally covered with sandstone slabs and angular gravels. Large bedrock outcrops also occur in some locations. Valley bottoms are generally narrow with very steep canyon walls. Ridgetops are wide and gently sloping.

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. The assessment utilized topography to define the likely region of influence; 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**).

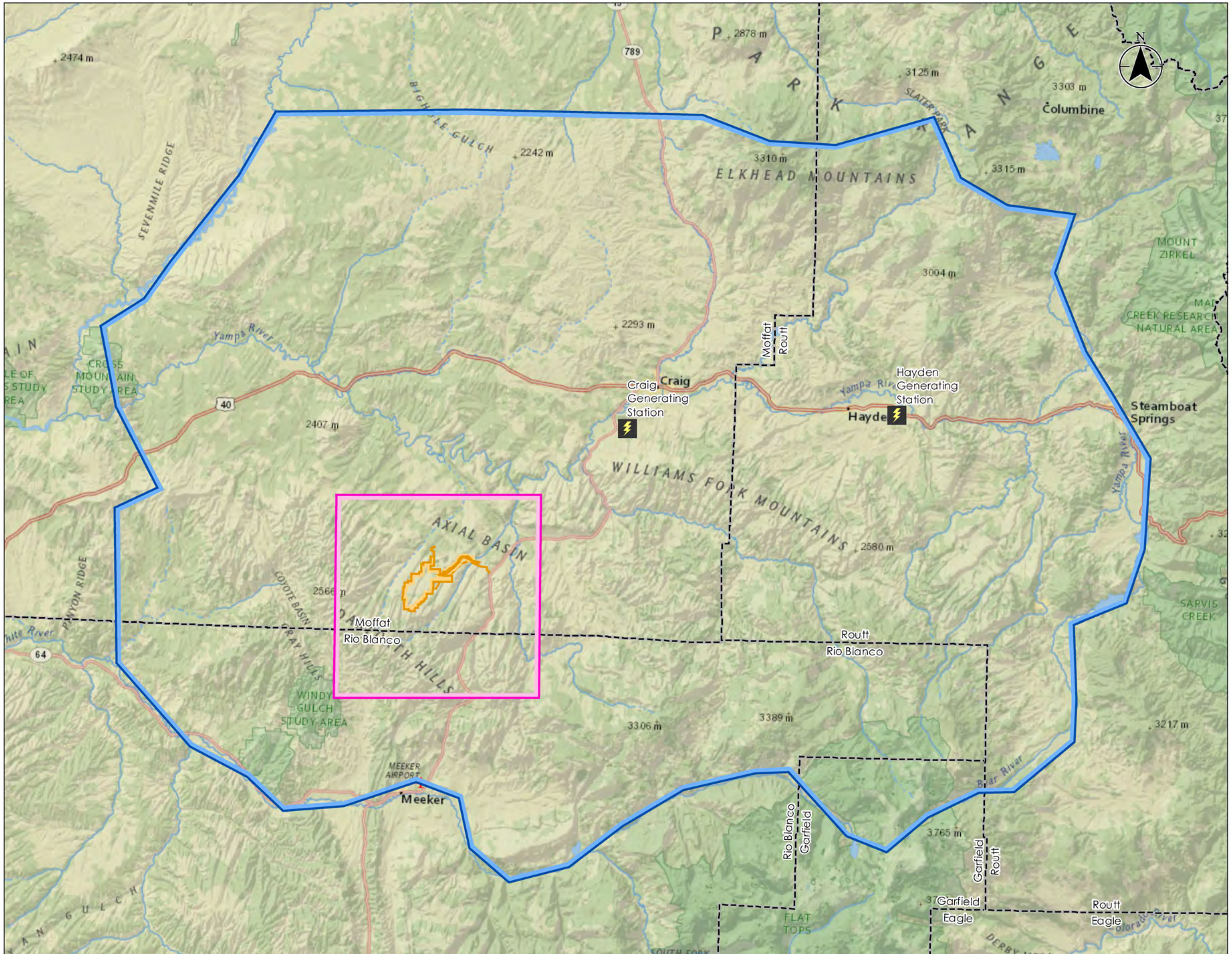
3.3.2 Regional Climate

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 5.1 miles (8.2 km) east of the center of the Collom Lite Pit and 4.3 miles (6.9 km) east of the Little Collom X pit, at an elevation of 7,395 feet amsl. The Gossard Site is 6.2 miles (10 km) northeast of the center of the Collom Lite pit and 4.5 miles (7.2 km) north east of the center of the Little Collom X 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 (OSMRE 2016). 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 1996 through the present and the University of Utah's Mesowest provides data for this site since January 1997 through the present (OSMRE 2016).



Project Area

Air Quality Analysis Area

Regional Airshed Boundary

Generating Station

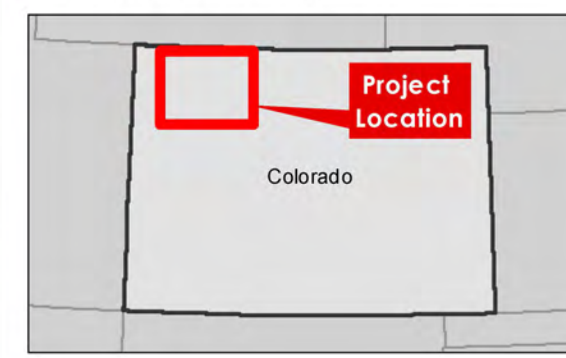
County Boundary

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

Rio Blanco & Moffat Counties
Colorado

Project

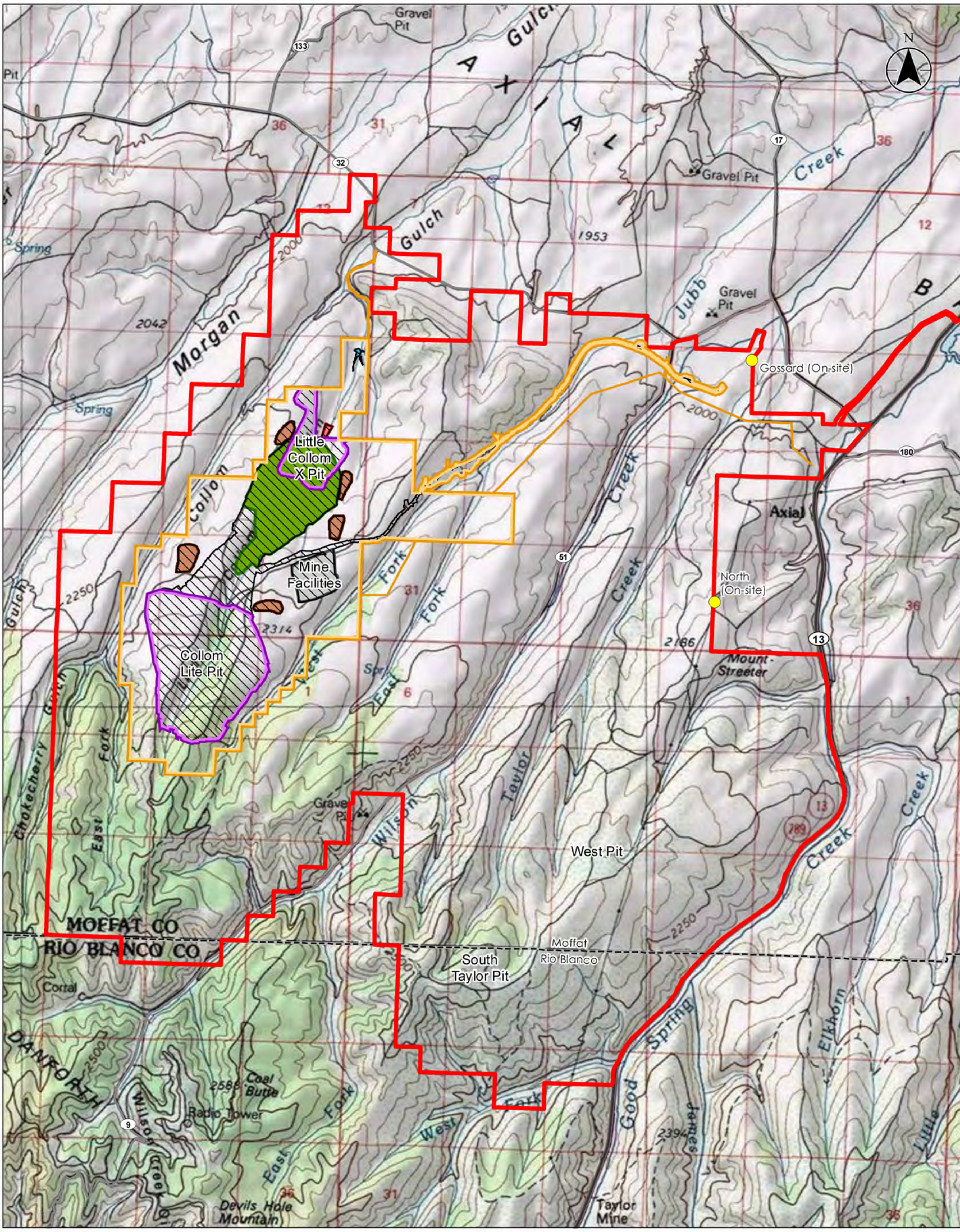
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

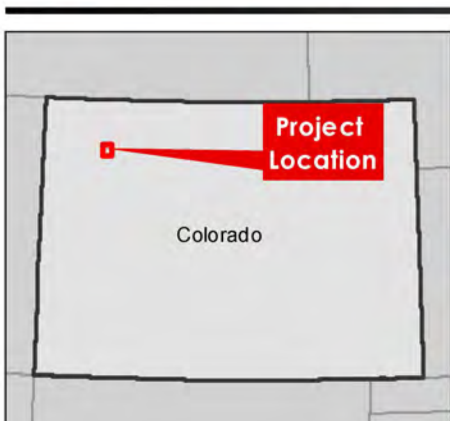
Figure No.

3-1

Title

Air Quality Region





- Air Quality Monitoring Site
- Project Area
- Disturbance Area
- Temporary Overburden Stockpile
- Little Collom Sump
- Mine Facilities
- Sediment Pond
- Temporary Topsoil Stockpile
- Proposed Mine Pit Area
- Approved SMCRA Permit Boundary
- County Road
- Highway
- County Boundary

0 4,000 8,000 Feet
1:64,000 (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
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan 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 (OSMRE 2016).

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 5.0 m/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 (all Colorado communities are currently in attainment of all NAAQs except the Front Range ozone control area, which is in nonattainment for the eight-hour ozone standard).

Table 3.3-1 National Ambient Air Quality Standards

Pollutant		Primary/ Secondary	Averaging Time	National Standard	Form
Carbon Monoxide (CO)		Primary	8-hour	9 ppm	Not to be exceeded more than once a year
			1-hour	35 ppm	
Lead		Primary and secondary	Rolling 3 month average	0.15 μg/m^3	Not to be exceeded
Nitrogen Dioxide (NO_2)		Primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentration, averaged over 3 years
		Primary and secondary	Annual	53 ppb	Annual Mean
Ozone		Primary and secondary	8-hour	0.070 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution	$PM_{2.5}$	Primary	Annual	12 μg/m^3	Annual mean, averaged over 3 years
		Secondary	Annual	15 μg/m^3	Annual mean, averaged over 3 years
		Primary and Secondary	24-hour	35 μg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary and secondary	24-hour	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		Primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year
		n/a	3-hour*	700 μg/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, 2015
μg/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[2].

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 PSD minor source of air quality emissions 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. Project emissions estimates are included in **Chapter** 4. 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 under Colorado state law.

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.

[2] 5 CCR 1001-05, Regulation Number 3, Part D, Concerning Major Stationary Source New Source Review and Prevention of Significant Deterioration

Table 3.3-2 Federal Prevention of Significant Deterioration Limits

Pollutant	Averaging Time	Maximum Allowable Increase (µg/m³)		
		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

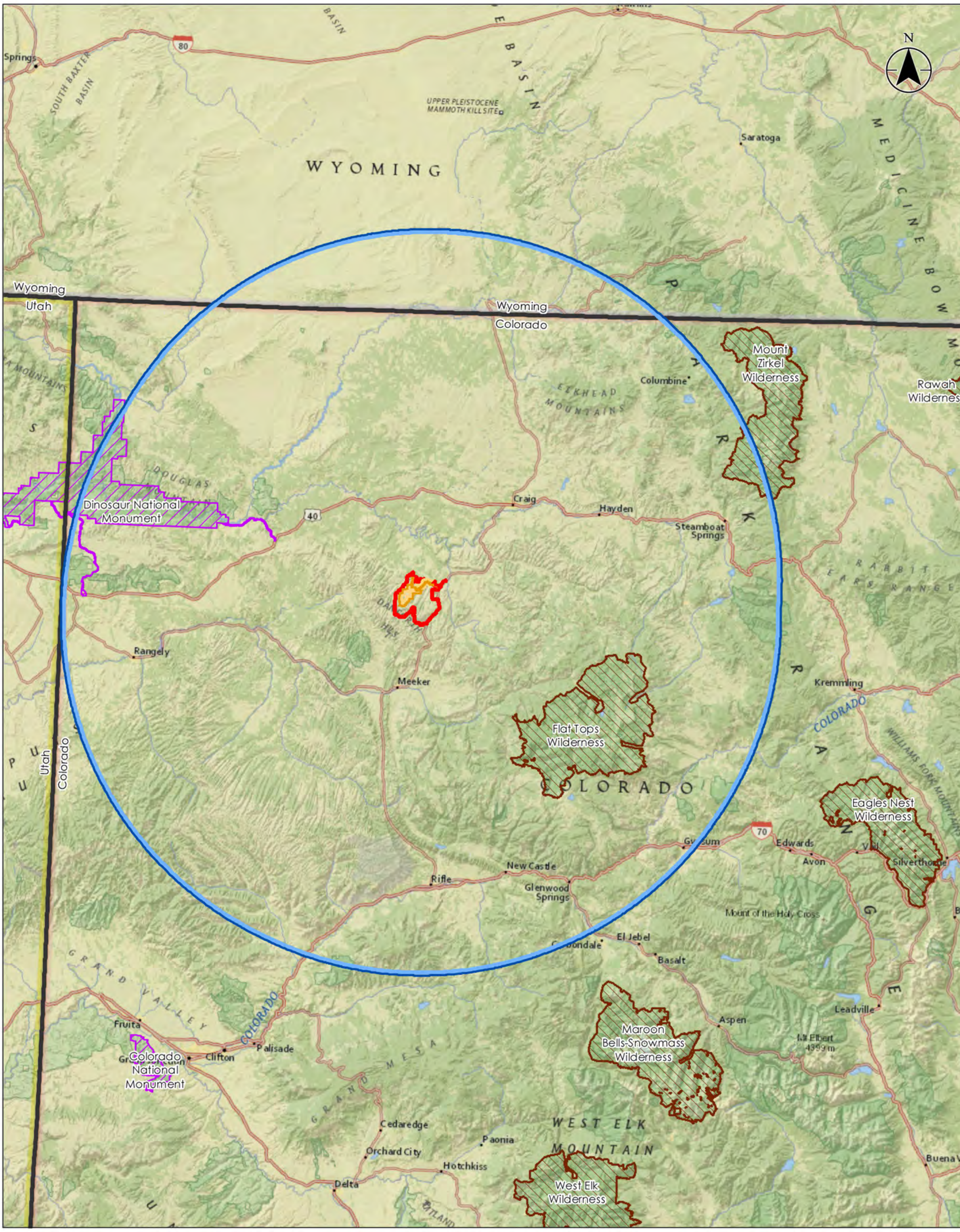
µg/m³ = Micrograms Per Cubic Meter of Air

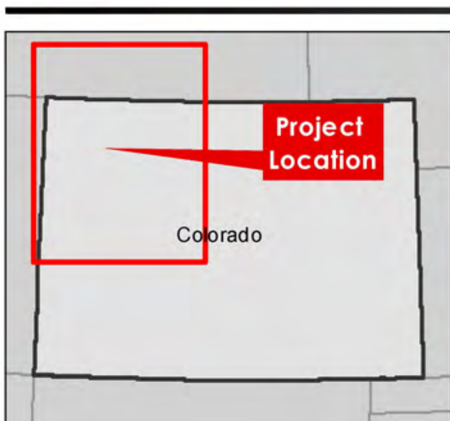
The CAA Amendments of 1990 introduced a new facility-wide Federal Operating Permit program. Federal Operating Permits, also known as Title V permits, are required for facilities with the potential to emit more than 100 tpy of a regulated pollutant, 10 tpy of any single hazardous air pollutant (HAP), 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 pollutants 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 such as 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 Title V 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





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

0 18 36 Miles

1:1,140,480 (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

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

3-3

Title

Class I Areas

it to comply with the Mercury and Air Toxics Standards (MATS)[3]. The emissions limits associated with the MATS rule are presented in **Table 3.3-3**. Based on the facility's mercury emission rates, the Craig Generating Station is required to comply with the MATS rule. The Craig Generating Station attained compliance with MATS for Units 1 and 2 at the facility previously and Unit 3 attained compliance in April of 2015. Each unit at the Hayden Generating Station is considered a Low Emitter, emitting no more than 29 lbs of mercury per year (Colorado Regulation No. 6, Part B, Section VIII.B.10). Low Emitters are exempted from the technology-based emissions standards of the Colorado Utility Mercury Reduction Program. In addition, by emitting less than 29 lbs of mercury per year, the units met the emissions standards required by the MATS rule.

Table 3.3-3 MATS Emission Requirements

		Subcategory	Mercury Emission Limit (lbs/GWh)
Coal and Oil Fired Units	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
lbs/GWh = pounds of pollutant per gigawatt hour – 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

[3] 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). On December 1, 2015, USEPA published a "Proposed Supplemental Finding and Request for Comment" in the *Federal Register*, which states that consideration of cost does not alter the USEPA's previous conclusion that the MATS is appropriate and necessary under the Clean Air Act. 80 FR 75025. Although this regulatory and legal process is ongoing,, for purposes of this EA, the analysis includes the MATS rule in effect because the primary emitters have already complied with those standards and because the USEPA has proposed to retain those standards.

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 two units that are BART eligible (Units 1 and 2). These two units, along with Unit 3, are included in the current Regional Haze SIP. As a result, Units 1 and 2 are required to meet specific NOx standards. To help meet applicable standards, Selective Catalytic Reduction (SCR) systems are being or will be installed to control NOx emissions. They have also installed wet lime scrubbers for SO_2 control, which have been 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 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"[4]. 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 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[5].

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 Area. All Colorado communities are currently in attainment of all NAAQs (except the Front Range ozone control area, which is in nonattainment for the eight-hour ozone standard); therefore, regional monitoring data from 2014 provide an accurate representation of air quality in the Project region.PM_{10} data from two monitoring locations, one in Steamboat Springs, 55 miles (89

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

[5] Colorado SIP Mount Zirkel Technical Support Document https://www.colorado.gov/pacific/sites/default/files/AP_PO_Mount-Zirkel-Wilderness_0.pdf

km) east-northeast of the Project Area, and one in Parachute, 58 miles (94 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 ($\mu g/m^3$); the highest concentration for Steamboat was 84 $\mu g/m^3$; and the highest concentrations for Rifle and Grand Junction were 47 $\mu g/m^3$ and 46 $\mu g/m^3$, respectively. All values were below the NAAQS (150 $\mu g/m^3$) (**Table 3.3-4**).

Additional recent PM_{10} data are available for rural northwest Colorado locations at the Greasewood Hub (33 miles southwest) and the Williams Willow Creek Gas Plant (38 miles southwest). Monitoring at Greasewood was conducted from 2009–2010 with the second highest 24-hour value being 101 $\mu g/m^3$, which included impacts from employee vehicles using a nearby dirt parking lot. Williams had a 24-hour second high value of 119 $\mu g/m^3$ for 2012. Colowyo collected PM_{10} data at its western monitoring site, located in a valley west of the mine from 1997–1998. The second-highest 24-hour value of 23 $\mu g/m^3$ is considered to represent PM_{10} levels in the absence of the mine.

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). NO_2 data is also collected at Rangely, the Greasewood Hub, the Williams Willow Creek Gas Plant, and at the Oxy Conn Creek facility. Rangely showed a highest 1-hr value of 20 ppb in 2014 and the Greasewood Hub recorded a 1-hr second high of 42 ppb in 2009–2010, which included facility impacts. In 2012 the Williams Willow Creek Gas Plant had a 1-hour second high of 11 ppb and from 2011-2012 the Oxy Conn Creek facility (60 miles south-southwest of the Project Area) recorded a 1-hour second high of 43 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 recorded at Rangely in 2014 was 17.8 $\mu g/m^3$. The highest 24-hr concentration background at the site during 2014 was 17.8$\mu g/m^3$, which is below the NAAQS (35 $\mu g/m^3$). $PM_{2.5}$ data is also collected in Grand Junction as well as at the Greasewood Hub and Williams Willow Creek. $PM_{2.5}$ monitoring in Grand Junction showed a maximum 24-hr concentration of 21.7 $\mu g/m^3$ in 2014. The 98th percentile monitored value at the Greasewood Hub was 12 $\mu g/m^3$ from 2009 – 2010; the 98th percentile monitored value at Williams Willow Creek was14 $\mu g/m^3$ in 2012. The Greasewood and Williams' data are considered to be representative of background levels in rural areas of northwest Colorado.

3.3.5.3 Ozone

The nearest representative ozone data is collected at Lay Peak (17 miles [27 km] northwest of the Project Area). The highest 8-hr concentration measured at the site during 2014 was 0.067 parts per million (ppm), which is below the NAAQS (0.070 ppm).

Ozone data is also collected in Rifle, Palisade, Meeker, Rangely, and Walden. In 2014 the highest 8-hr value at Rifle was 62 ppb. Palisade recorded an 8-hr highest value of 64 ppb for 2014. The highest recorded values in 2014 for Meeker and Rangely were 63 ppb and 66 ppb, respectively. Walden, in Jackson County, showed a highest 8-hr concentration of 63 ppb. Monitoring at Greasewood Hub showed an 8-hr fourth maximum of 72 ppb for 2009 – 2010, while Oxy Conn Creek recorded an 8-hr fourth maximum of 59 ppb during 2011-2012. Williams Willow Creek Gas facility had 8-hour fourth maximum of 68 and 63 ppb in 2012 and 2013, respectively. Attainment of the 8-hr ozone standard is assessed via the three-year average of the fourth highest 8-hr concentration for each year. All of the monitors listed above show compliance with the 8-hr ozone standard (70 ppb), with the exception of the Rangely site. A fourth maximum of 91 ppb observed at the Rangely site in 2013 has led to a 3-year average above 70 ppb for this site.

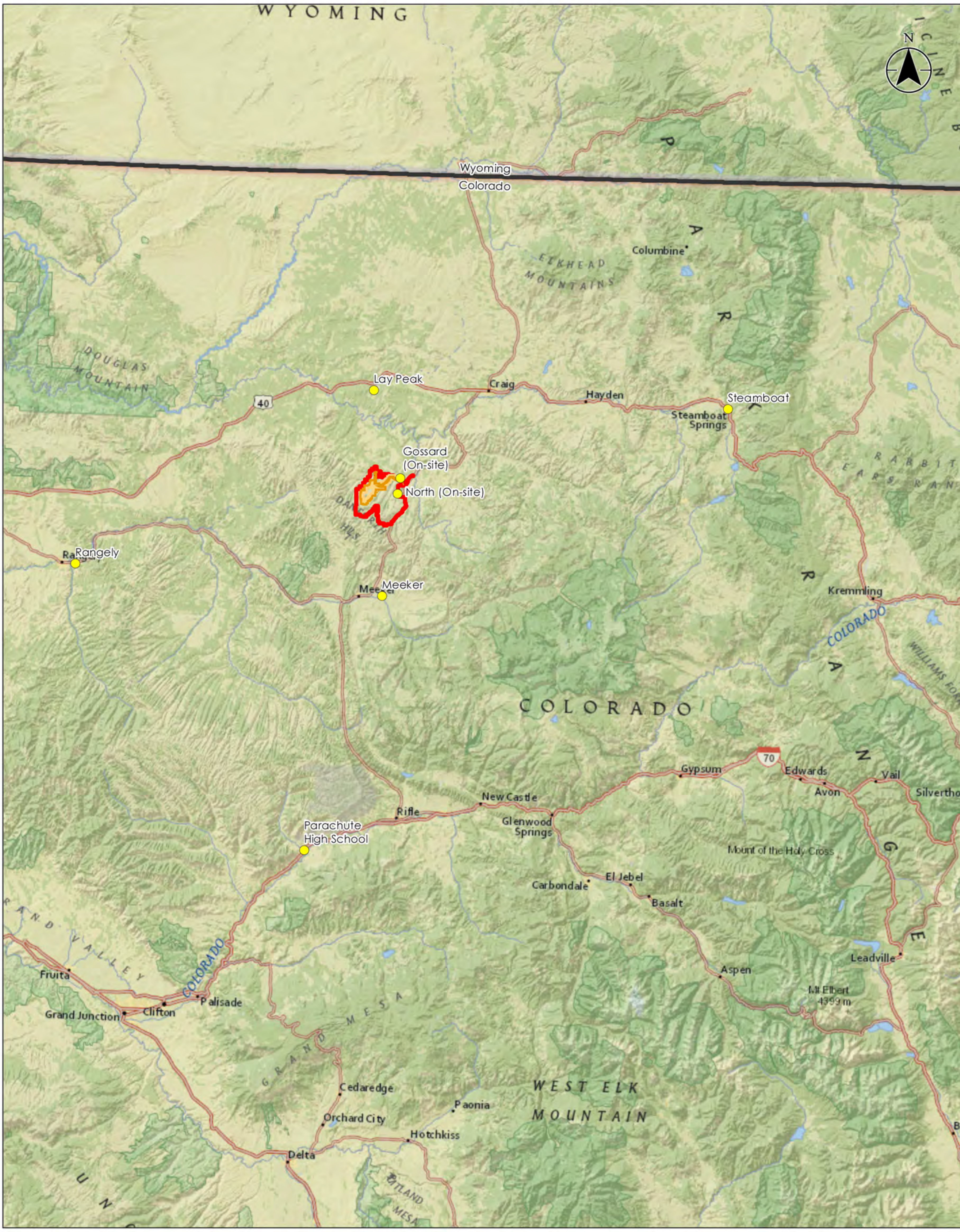
3.3.5.4 SO_2 and CO

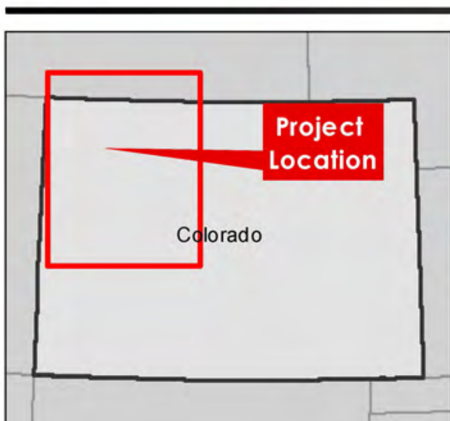
The Williams Willow Creek station, which is operated by the Williams Field – Willow Creek Gas Plant, monitors both SO_2 and CO, and is within 38 miles (61 km) of the Project Area. In 2012, measured second maximum concentrations of SO_2 were 1.0 ppb for the 1-hr, 3-hr, and 24-hr averaging periods; measured maximum concentrations of CO were 1.0 ppb in 2012 for the 1-hr and 8-hr averaging period. 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.[6], backgrounds of zero have been used when no monitoring data exists. The nearest government-operated monitoring station for SO_2 and CO is 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 were 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 Coal Mine would not be categorized as a major source for HAPs because the mine produces approximately 2 tpy of total HAPs. Emissions calculations are included in **Chapter 4**.

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





Air Quality Monitoring Site

Project Area

Approved SMCRA Permit Boundary

State Boundary

0 16 32 Miles

1:1,013,760 (At Original document size of 11x17)

Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan 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 2014 Regional Air Quality Monitoring Conditions

Monitor	Location	Active Since	Monitoring Agency	Annual Samples	Elevation (ft.)	1-hr Highest Value, 2014	3-hr	8-hr Highest Value, 2014	24-hr Highest Value, 2014
PM_{10} (µg/m^3)									
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	58 mi (94 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[1]	51 mi (82 km) southwest near Rangely, CO	2011	BLM	8,592		19.6			
Meeker	18 mi (28 km) south in Meeker, CO	2011	BLM	8,584	6,500	6.1			
SO_2 (ppb)									
Walden - Colorado, Chandler Ranch	91 mi (145 km) northeast, north of the Project Area	2012	USFS	4,452 (inadequate recovery rate)	7,930	1			0.5
CO (ppm)									
Walden - Colorado, Chandler Ranch	91 mi (145 km) northeast, north of the Project Area	2013	USFS	4,330 (inadequate recovery rate)	7,930	0.3		0.3	

Monitor	Location	Active Since	Monitoring Agency	Annual Samples	Elevation (ft.)	1-hr Highest Value, 2014	3-hr	8-hr Highest Value, 2014	24-hr Highest Value, 2014
$PM_{2.5}$ (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	BLM	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	BLM	206 days out of 214 required				0.063	
Rangely	51 mi (82 km) southwest near Rangely, CO	2011	BLM	203 days out of 214 required				0.066	
Lay Peak	17 mi (27 km) northwest, west of Craig, CO	2012	CDPHE	6,516	6,250			0.067	

µg/m^3 = micrograms per cubic meter of air; ppm = parts per million; ppb = parts per billion

[1] The sites are operated under a contract and reported through the National Park Service data system.

3.3.7 Onsite Air Quality

Colowyo Coal mine currently monitors for ambient concentrations of PM10. PM10 is the only pollutant for which ambient monitoring is being completed. 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 Coal 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.

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 level of the standard does not directly equate to a violation of the standard (or a non-attainment determination).

Table 3.3-5 Colowyo Coal 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	288	-	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	192	167	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 Coal Mine PM_{10} *fugitive dust* 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 Coal 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 *fugitive* dust mitigation measure.

The final four daily high value events occurred in 2012 through 2015 (**Table 3-3.5**). *The Colowyo mine area and the Axial Basin at large is an expansive open area that is largely treeless; the area regularly experiences high winds due to the open fetch of the land. However,* events 9 and 10 are potentially associated with natural or exceptional high wind events. *Colowyo has investigated these events and developed and submitted exceptional events reports to the State of Colorado* (Colowyo 2013b, Colowyo 2013c, and Colowyo 2013d). The January 29, 2014 and January 5, 2015 events (Events 11 and 12) are currently being evaluated; site data indicates these events may also qualify as a natural or exceptional event. It should be noted however, that the State of Colorado has not reviewed the documentation regarding the 2012 through 2015 events and no documentation has been submitted to EPA. 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; OSMRE 2016). 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 20 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[7]

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	1,232.8	12,091.0	3,261.0	62.2	52.26
Hayden Generating Station	148.3	67.5	385.1	6,483.6	2,330.7	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 (OSMRE 2016). 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.

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 Coal Mine continues to pursue additional clients.

3.3.10 Climate Change

The primary natural and synthetic greenhouse gases (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

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

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 (**Table 3.3-7**). 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**

Source: EPA (2010)

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**

Source: EPA (2010)

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 mmt 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[8]), 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.

[8] *Utility Air Regulatory Group v. EPA*, U.S., 134 S. Ct. 2427 (June 23, 2014)

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 finalized the Clean Power Plan rule on August 3, 2015. The rule applies to affected power plants that began construction on or before January 8, 2014 and is designed to reduce carbon emissions on a rate and mass basis. The rule is currently being legally challenged by a consortium of 24 states but 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 is 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. Black carbon is an unregulated pollutant; as such, black carbon emissions from the Craig and Hayden Generating Stations are not quantified or regulated. According to the 2012 Report to Congress on Black Carbon, the bituminous and sub-bituminous coal categories, both of which primarily represent electricity generating units but may also reflect small contributions from commercial and institutional sources, represent relatively small contributions to black carbon emissions in the U.S. (slightly more than 1 percent each)[9]. 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[10]. 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.

3.4 GEOLOGY

The Project Area is located in the northern-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 2011, USGS 2008). Geologic maps and stratigraphic sections can be found in various references (e.g., CGS 2015; USGS 2008; Colowyo 2007 (Figure 2.04.6-1,

[9] USEPA 2012, Report to Congress on Black Carbon March 2012, Department of the Interior, Environment, and Related Agencies Appropriations Act, 2010. EPA-450/R-12-001

[10] http://www.epa.gov/blackcarbon/basic.html

2.04.6-2, Map 7); KEC 2005). General elevations for the Project Area range from 6,000 to 8,500 feet amsl.

The Project Area lies within a region that is deformed by *tectonic uplift that has resulted in the development of* several major *anticlinal and synclinal structures in the region*. The Project Area occurs on the southern *limb* of the generally southeast-trending asymmetrical Collom Syncline and extends east toward the north-northeast-trending Elkhorn Syncline (KEC 2005, USGS 2008). 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 seen presently 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, the axis of which occurs in the basin north of the Project Area (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. Local occurrences of Quaternary alluvium, colluvium, alluvial fan deposits, and landslide deposits unconformably overlie the Williams Fork Formation, particularly in stream valleys within the Project Area (BLM 2006).

A total of *nine* coal seams *are planned to be mined* within the Project Area. In descending *stratigraphic* order they are: *"Y", "X", "A" "B", "C", "D", "E", "F", and "G". Seam thicknesses vary but generally range between five feet and 11 feet. All nine seams are proposed to be mined in the Collom Lite Pit and two seams, the "X" and "Y" seams, are proposed to be mined in the Little Collom X Pit. The quality of the coal reserves proposed to be mined is midway between bituminous and sub-bituminous, low ash, and low sulfur (CDRMS 2013).*

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, the mining operations, road and utility corridors, and surface facilities would be located within three small drainage basins. From west to east, they are Collom Gulch, Little Collom Gulch, and West Fork Jubb Creek (**Figure 3-5**). In addition, the northeast end of the proposed haul road and power line corridor would be located in the Jubb Creek and Wilson Creek basins, and would connect the existing Colowyo Coal Mine operations to the Project.

All of these tributaries flow generally northeast through narrow, steep-sided valleys on their way to ultimately join the Yampa River. Collom and Little Collom gulches flow into Morgan Gulch several miles north of the Project Area; Morgan Gulch then joins the Yampa River. Jubb Creek combines the flows from its East and West Forks, and joins Wilson Creek north of the Project Area. In turn, Wilson Creek flows into Milk Creek and then into the Yampa River upstream of its confluence with Morgan Gulch.

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 the small 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 2011). As is common with incised channels, many reaches have unstable cut banks and recently-slumped surfaces, although some riparian vegetation is also present. Near the northern end of the Project Area, in the vicinity of the axis of the syncline, the valleys become less confined.

Streamflows that are in and near the Project Area result from watershed runoff contributions and/or interaction with groundwater (including seeps and springs). Monitoring records show that flows vary seasonally, with peaks generally snowmelt-based. For example, the U.S. Geological Survey (USGS) monitored stream flows in Jubb and Wilson creeks north of the Project Area during separate time frames, but both stations exhibited a wide range of measured flows. At the Jubb Creek station (#9250610), with a drainage area of about 7.5 square miles (19.4 km^2), flow rates ranged from 0 cubic feet per second (cfs) to 5.6 cfs over a four-year period in the late 1970s. The Wilson Creek station (#9250507), with a drainage area of about 20 square miles (51.8 km^2), had streamflows ranging from 0 to 352 cfs between 1981 and 1992. Both streams were determined to have a base flow of 1.0 cfs or less, based upon a study that took place between 1978 and 1981 (Colowyo 2011).

From December 2004 through May 2006, tributary stream flows were monitored at various other locations in and near the Project Area (Colowyo 2011). In 2011, Colowyo began monitoring these streams quarterly, with data collection *at some of the sites* continuing to date (Colowyo 2015). These two combined data sets are summarized in **Table 3.5-1**. **Figure 3-5** shows site locations. *Note that some of the monitoring sites are currently being monitored, but others were discontinued after an adequate baseline data set had been collected.* The data reflect the nonperennial flow regimes, the small contributing watershed areas, and the headwater nature of these Project Area surface water resources. Small stock ponds located on both the East and West forks of Jubb Creek partially control downstream flows, and small stock ponds in Little Collom Gulch collect and at times store runoff. There is a loss of stream flow to the valley fill between the upstream and downstream Collom Gulch stations during spring snowmelt, with a probable reemergence that contributes to stream flow farther downstream later in the season (BLM 2006).

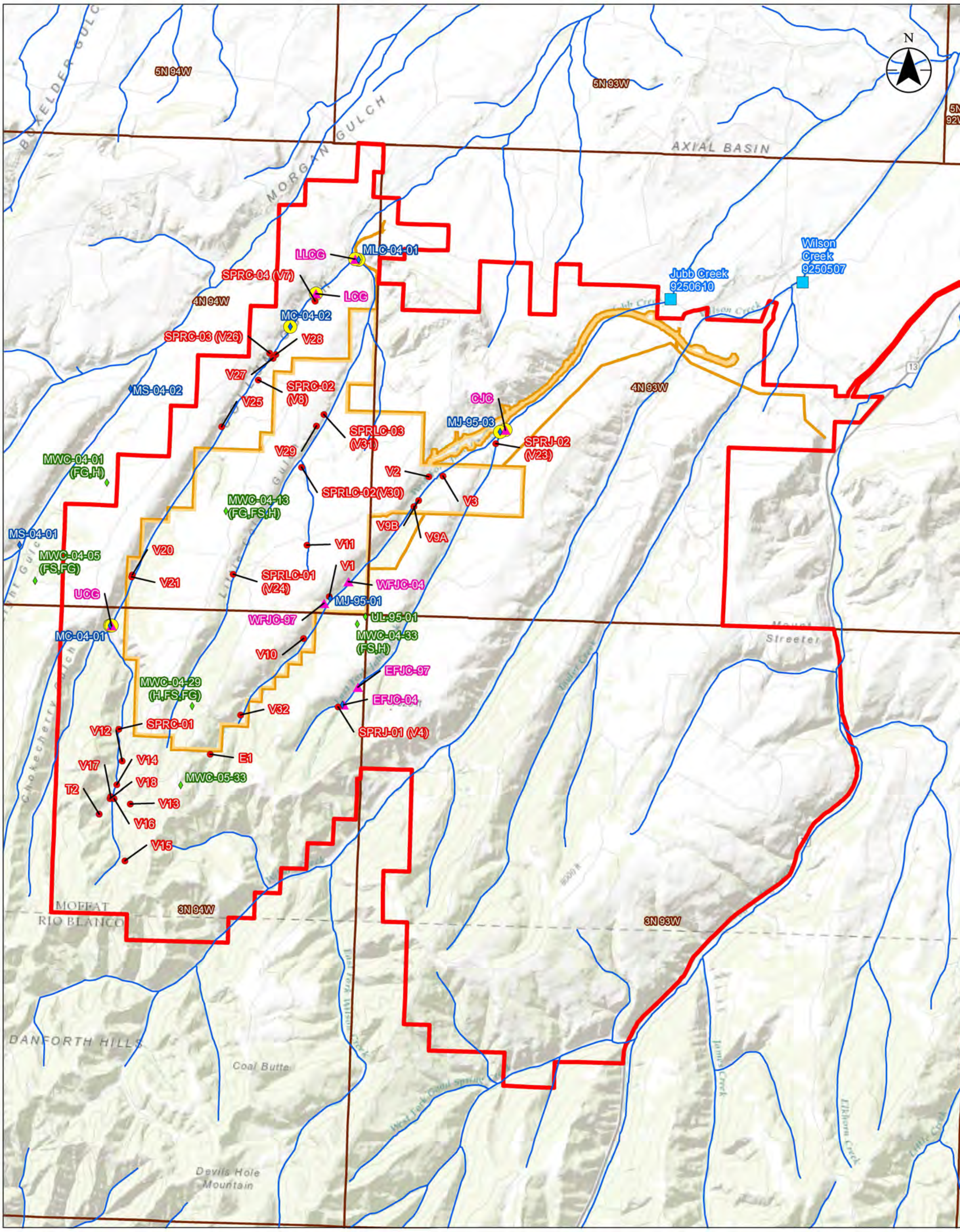
Table 3.5-1 Stream Flow Data (cfs)

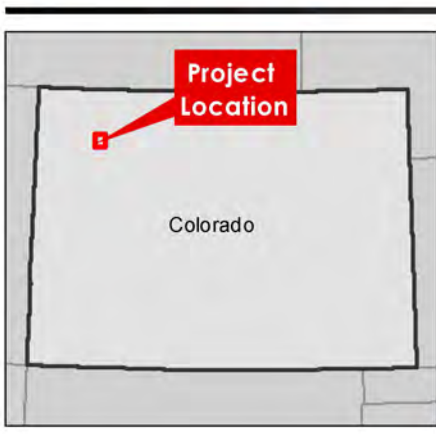
Site ID[1]	Sampling Period 2004-2006				Sampling Period 2011-2014			
	N[2]	Average	Minimum	Maximum	N[2]	Average	Minimum	Maximum
CJC	14	0.07	Dry	0.25	16	0.09	0.02	0.22
WFJC	12	0.04	Dry	0.30	15	0.04	0.01	0.13
EFJC	15	N/A	Dry	No Flow	N/A			
LLCG	13	Dry	Dry	Dry	N/A			
UCG	13	0.54	Frozen	3.5	15	0.24	0	1.23
LCG	15	0.47	0.004	3.5	16	0.35	0.04	1.57

[1]See **Figure 3-5** for locations *of water monitoring sites, some of which are no longer active because they were only used to determine baseline conditions.*
[2]n=number of observations

The flow data, as well as other physical measurements, were used to characterize most of the tributary streams within the Project Area as ephemeral or intermittent (BLM 2006). One exception is Wilson Creek, which is a perennial stream at the proposed haul road/power line crossing. The lower reaches of Collom Gulch and Jubb Creek downstream of its forks are perennial (Colowyo 2011). In the upper reaches of these tributary channels, some stream flow likely infiltrates into the valley fill and recharges the groundwater system. Further downstream, groundwater discharges may support stream flows.

Local seeps and springs are the result of groundwater discharge that may also contribute to surface water flows within the Project Area. However, based upon measured flow rates obtained during baseline monitoring in the mid-2000s, these do not represent substantial groundwater discharge areas (Colowyo 2011). **Figure 3-5** shows the locations of these seeps and springs, most of which are located in and along the sides of the stream valleys. They appear to indicate discharge of perched groundwater from the discontinuous bedrock units. The baseline monitoring data is discussed below (none of these sites are currently being monitored by Colowyo).





USGS Station (discontinued)

Bedrock Monitoring Well

Valley Fill Monitoring Well

Seep & Spring Monitoring Site

Surface Water Monitoring Site

Active Monitoring Site

Streams

Approved SMCRA Permit Boundary

Project Area

Township Boundary

0 0.9 1.8 miles

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

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance

Project Location

Rio Blanco & Moffat Counties
Colorado

Client

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

3-5

Title

Hydrology

Eight seep and spring locations were identified and monitored along the axis of West Fork of Jubb Creek, and two additional locations were identified along East Fork Jubb Creek (**Figure 3-5**). Some of these sites lacked sufficient flows to collect samples, although some field parameters were obtained in most of those cases. Based upon these limited data (from one to three measurements per site), the lowermost spring in East Fork Jubb Creek (SPRJ-02) appears to convey the largest flows of all of the springs in those two forks, with the maximum observed being 0.060 cfs. The five identified spring or seep sites in Little Collom Gulch (with two to four measurements per site) also occur in and/or along the stream channel; they are located within the proposed Collom Lite pit boundaries. The largest flow in that group was measured at the middle spring (SPRLC-02), with a maximum rate of 0.25 cfs. Numerous small seep or spring discharges occur along the East Fork of Collom Gulch; one of the larger ones had a maximum measured flow of 0.15 cfs. In addition, eight springs or seeps were identified along the mainstem of Collom Gulch, three of which had maximum flows that were greater than 0.04 cfs.

The maximum (i.e., spring season) aggregate potential for these sources to contribute to stream flows, based upon the collected data, is as follows: 0.75 cfs to Collom Gulch; 0.17 cfs in Jubb Creek; and 0.32 cfs in Little Collom Gulch. The contributions to the latter are apparently absorbed into valley fill or retained in stock ponds at some point upstream of stream flow sampling location LLCG, which was dry during all sampling attempts during the baseline data collection. Minimum (summer/fall) spring/seep flow contributions ranged from 0.02 cfs to 0.07 cfs for these streams (Colowyo 2011).

Water quality data for streams and seeps/springs were also collected during baseline monitoring, where flows were sufficient to do so. Only four of the stream sites had enough water to collect samples: two sites located in Collom Gulch (UCG and LCG), one site located on the mainstem of Jubb Creek (CJC) and one located on its West Fork (WFJC). Further, as indicated in **Table 3-5.1**, the latter two only had sufficient flow for sampling during two of the monitoring events over the baseline period. Similarly, only about half of the seep and spring sites had enough water to collect samples. Data from these sites (both the streams and the springs) were all of a mixed type, in which there was no single dominant cation or anion at any of the sites. While data for both of the drainages indicate increasing total dissolved solids (TDS) concentrations in the downstream direction, the Collom Gulch samples (average of 450 mg/L [milligrams per liter] at the upper site and 729 mg/L at the lower) have much lower TDS than the Jubb Creek samples (average of 1,055 mg/L at the upstream site and 1,785 mg/L at the downstream site). The TDS at springs and seeps was also variable, ranging from an average of 400 mg/L at SPRJ-01 up to an average of 1,700 mg/L at SPRJ-02; both of these sites are in East Fork Jubb Creek. More recent data (Colowyo 2015) from the four aforementioned stream sites show similar results (**Table 3.5-2**).

Iron, mercury, and selenium are specific trace constituents of local or regional interest in regard to surface water quality. Iron concentrations have been elevated in the Yampa River downstream of Craig for a number of years. *Currently, Wilson Creek (one of the tributaries of the lower Yampa)* is on the State's 303(d) list of impaired waters *for iron (and sulfate)* (CDPHE *2016*). 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. 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 percent), due to the sediment that is collected as part of the water sample."

Mercury is one of the pollutants conveyed in the atmosphere that 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. Unlike many other pollutants, the primary source of mercury in streams is likely to be via atmospheric deposition (USGS 2015a). EPA's latest published National Emissions Inventory (NEI) (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, because 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 (52 sampling occurrences) showed that the majority of values were reported at less than the laboratory reporting limits, and the maximum reported was 0.10 micrograms per liter (µg/L) (USGS 2015b). The State of Colorado chronic aquatic life water quality standard for mercury is 0.01 µg/L (0.00001 mg/L) (CDPHE *2012a*).

Selenium is another constituent of interest in the region's surface waters. The chronic aquatic life standard for total selenium is 4.6 µg/L (0.0046 mg/L) (CDPHE *2012a*). Current monitored selenium levels in surface waters surrounding the Project Area range between 5 and 15 µg/L, which is below the EPA's maximum contaminant level goal of 50 µg/L (0.05 mg/L) for human consumption, and the Colorado Water Quality Control Commission's acute standard for dissolved selenium of 18.4 µg/L and chronic standard of 4.6 µg/L for aquatic life protection.

Colowyo's baseline monitoring in Collom and Jubb creeks includes mercury and selenium. Data (Colowyo 2015) are summarized in **Table 3.5-2.** Colowyo's reporting of data that are less than the laboratory reporting limits as values, rather than as non-detects, affects the interpretation of some of these results. Notably, all mercury values were reported as 0.001 mg/L, but in actuality were almost certainly non-detects, i.e., less than 0.001 mg/L.

Table 3.5-2 Surface Water Quality Quarterly Monitoring Data (2011-2014)

Site ID[1]	N[2]	Total Dissolved Solids (TDS), mg/L			Iron (Fe) (dissolved), mg/L				Mercury (Hg) (dissolved), mg/L				Selenium (Se) (dissolved), mg/L			
		Average	Min	Max	N[2]	Average	Min	Max	N[2]	Average	Min	Max	N[2]	Average	Min	Max
CJC	16	1,520	670	1,820	16	0.30	0.05	1.61	16	0.001	0.001	0.001	16	0.008	0.005	0.015
WFJC	16	920	770	1,450	16	0.42	0.05	3.57	16	0.001	0.001	0.001	16	0.011	0.006	0.015
UCG	15	499	290	820	15	1.39	0.05	6.87	15	0.001	0.001	0.001	15	0.006	0.005	0.012
LCG	16	701	550	860	16	0.81	0.05	3.32	16	0.001	0.001	0.001	16	0.005	0.005	0.009

[1]See **Figure 3-5** for locations *of water monitoring sites, some of which are no longer active because they were only used to determine baseline conditions.*
[2]n=number of observations

3.5.2 Groundwater

Geologic structure and composition in the vicinity of the proposed Project are responsible for the location and presence of groundwater and as noted above, groundwater is present in or near the surface within the Project Area at a few locations (e.g., gaining reaches of streams, seep and springs). The most notable structural feature is the Collom Syncline, mentioned above in the surface water section and discussed further in **Section 3.4**. The beds on the northern limb of the syncline dip toward the south at up to 40°, whereas the beds on the southern limb dip from 2° to 8° to the north. Although faults are not prevalent in the area, there are two joint sets that were determined to contribute to directionally-dependent permeabilities.

The area's upper-most aquifer of regional extent is generally considered to be the Trout Creek Sandstone, which is a member of the Iles Formation. However, there is little or no use of this groundwater in close proximity to the proposed mining activities. The closest known and registered/permitted domestic or commercial wells that are not owned by Colowyo Coal Company are located approximately 2 miles (3.2 km) south and southeast of the Project Area, in the SW1/4, Section 7, T3N, R93W (Colowyo 2011).

Overlying the Iles Formation is the Williams Fork Formation. It is up to 1,200-feet thick and consists of interbedded coal, shale, sandstone, siltstone, and mudstones. Some of these beds contain localized groundwater (notably the coal seams) and others serve as confining units (notably the KM Layer). The KM Layer (also known as the Yampa Bed) is a laterally-continuous, low-permeability clay bed that was formed from altered volcanic ash. It is present about 200 feet above the base of Williams Fork Formation. Of the coal seams that would be mined, the lowermost coal seam is located about 200 feet above the KM Layer. With a bed thickness ranging from about 0.5 foot to 5 feet, it serves as an aquitard separating the beds within the coal sequence to be mined and the underlying rocks including the lowest part of the Williams Fork Formation and the Trout Creek Sandstone. The valley fill found along area streams also generally contains and transmits groundwater.

Groundwater recharge areas within the Collom synclinal basin, containing the Project Area, are bounded by Trout Creek Sandstone outcrops around its periphery; the geology also isolates this portion of the aquifer from that associated with the Trout Creek Sandstone outside the synclinal basin. In addition to these outcrops, saturated valley fill in the stream channels and seepage from overlying units also contribute to recharge. While recharge is thought to be greater in the southern part of the area, discharge is more prevalent on the north side, where groundwater appears to surface in the valley fill of the incised drainages. The valleys also provide drainage for the perched small groundwater zones that are associated with the coal and sandstone units associated with the Williams Fork Formation. Thus, area groundwater generally flows northward, following the dip of the syncline, but lateral flow also occurs locally where intercepted by the adjacent stream drainages. At the northern, downgradient boundary of the Collom permit expansion area, the bedrock aquifers do not continue north past the north limb of the syncline, thus nearly all groundwater outflow from the Project Area occurs through the valley-fill aquifers. According to modeling (Colowyo 2011), about two-thirds of this outflow is assumed to be through the valley-fill aquifers with the remaining via stream base-flow.

The regional hydrogeologic model was developed for the Project Area and surrounding environment using a water balance approach. It estimated that the total flux of groundwater through the valley fill and bedrock units above the KM bed within the Collom Gulch and Jubb Creek drainages was estimated to be about 31,000 cfs (11 percent of the total groundwater flux) with the remaining thought to occur in the nearby Morgan/Straight Gulch, Wilson Creek, and Good Springs Creek drainages.

Various monitoring wells have been established in the area to track groundwater elevation and water chemistry. *Some of these wells were used to help establish baseline conditions and a subset are still monitored.* The data indicate that groundwater in the Trout Creek sandstone is confined in at least some locations in and near the Project Area. Within the proposed Collom Lite Pit area, unconfined conditions transition to confined conditions, with the saturated water table/piezometric surface at approximately 7,150 feet elevation. In the northern portion of the proposed Collom Lite Pit, bedrock is thought to be saturated below a depth of approximately 300 feet below ground surface. Water levels in valley-fill aquifer wells are typically 10 to 15 feet below ground level and exhibit greater seasonal trends than do the bedrock wells.

Groundwater quality data indicates that groundwater chemistry in the area varies with the geologic source (Colowyo 2011). **Figure 3-5** shows the monitoring well locations *for wells that were monitored in the past, some of which are still being monitored.* The Williams Fork Formation tends to produce calcium- or sodium-bicarbonate water type, and a moderate concentration of TDS (ranging from 440 to 1,000 mg/L). 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, but exhibits a narrower TDS range (600 to 710 mg/L). While water quality in the bedrock aquifers does not appear to substantially vary seasonally, spatial variation is seen. Downdip wells show a gradual evolution towards sodium-bicarbonate rich water. 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 varies seasonally with moderate to high concentrations ranging from 420 to 3,780 mg/L. More recent TDS data from some of the monitoring wells completed in alluvial valley fill show similar results (Colowyo 2015) (**Table 3.5-3**). Colowyo does not currently monitor bedrock wells in this area.

Table 3.5-3 TDS in Alluvial Groundwater (2011-2014)

Site ID[1]	N[2]	TDS, mg/L		
		Average	Minimum	Maximum
MC-04-01	16	690	600	830
MC-04-02	16	930	820	1,010
MLC-04-01	16	886	220	1,100
MJ-95-01	16	860	740	940
MJ-95-03	16	1,794	1,660	1,920

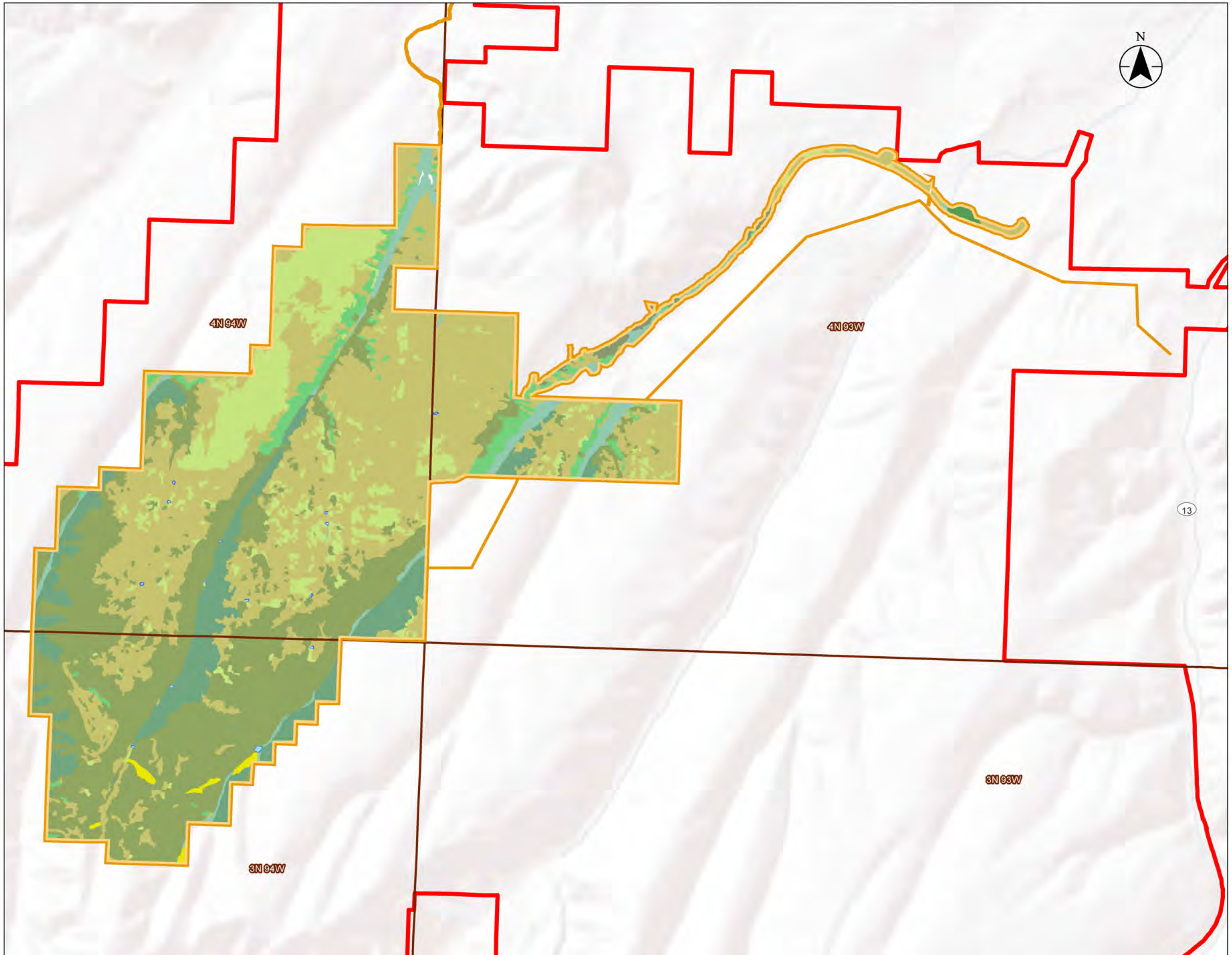
[1]See **Figure 3-5** for locations *of water monitoring sites, some of which are no longer active because they were only used to determine baseline conditions.*
[2]n=number of observations

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 Coal 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). Some of these CCRs are disposed of in a disposal site at the Trapper Mine located approximately 1 mile (1.6 km) 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 CDPHE 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

In 2006, the revised mine permit area and a 2 mile (3.2 km) buffer were surveyed (vegetation survey area) to determine what vegetation communities are present. The results of that survey as it relates to the Project Area are depicted in **Table 3.6-1**. The location of the vegetation communities *within the Project Area* is shown in **Figure 3-6**. A discussion of each vegetation community is presented below and taken from the PAP (Colowyo 2011).



Project Area

Approved SMCRA Permit Boundary

Township Boundary

Vegetation Type

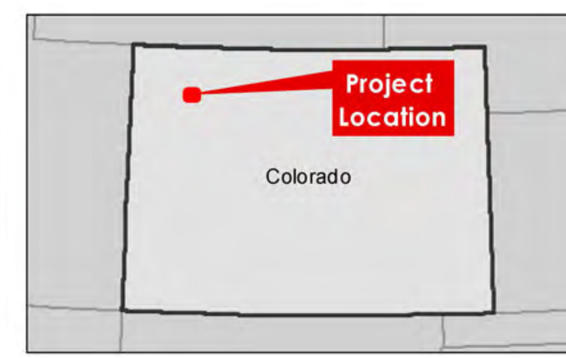
- Unmapped
- Aspen
- Bottomland
- Cultivated Fields
- Grassland
- Juniper Scrub
- Mountain Scrub (Mesic)
- Mountain Scrub (Xeric)
- Ponds/Wetlands
- Sagebrush (Mesic)
- Sagebrush (Xeric)

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. Basemap: Copyright:© 2014 Esri



Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

3-6

Title

Vegetation

Table 3.6-1 Vegetation Communities in the Vicinity of the Project Area

Vegetation Community	Acres	Percent of Total
Sagebrush (Xeric and Mesic)	*2,230.7*	46.*1*
Mountain Shrub (Xeric and Mesic)	*1,855.0*	38.*3*
Grassland	*523.7*	10.8
Bottomland	*148.5*	3.1
Aspen	*24.1*	0.5
Juniper Shrub	*41.7*	0.9
Cultivated Fields	*12.1*	0.*3*
Disturbed Areas	*5.1*	0.1
TOTALS	***4,840.9***	**100.0**

3.6.1 Sagebrush Community

The sagebrush vegetation community covers approximately *2,230.7* acres, or 46.*1* 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 during surveys. Common shrub species include mountain big sagebrush (*Atremisia tridentata ssp. vaseyana*), Wyoming big sagebrush (*Atremisia tridentata ssp. wyomingensis*), mountain snowberry (*Symphoricarpos oreophilus*), snakeweed (*Gutierrezia* sp.), and low rabbitbrush (*Chrysothamnus viscidiflorus*). Grasses and forbs found in these areas include western wheatgrass (*Pascopyrum smithii*), Sandberg bluegrass (*Poa sanbergii*), crested wheatgrass (*Agropyron desertorum*), and the non-native/invasive species Japanese brome (*Bromus japonicus*).

A majority of the sagebrush community found within the upper elevations of the Project Area is a relative monoculture of overly mature, dense, and decadent sage brush, which is not as ecologically beneficial. Colowyo has treated approximately 60 acres of sagebrush community *in the 1990s* to reduce the density of sagebrush as well as create pockets of grassland and young stands of sagebrush *(BLM 2006). However, it is not clear if such treatments occurred within the Project Area given the time that has elapsed since the treatments and it is difficult to visibly discern where they occurred.* At lower elevations with somewhat drier conditions the return of sagebrush to dominance appears to be much slower and grasses and seral shrub species, such as snakeweed and low rabbitbrush, are still dominant.

3.6.2 Mountain Shrub Community

The mountain shrub community covers approximately 1,855.0 acres, or 38.*3* 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, Gambel oak, serviceberry (*Amelanchier alnifolia*), and mountain big sagebrush. Grasses and forbs found in this community include bluegrass (*Poa* spp.), tailcup lupine (*Lupinus caudatus*), and the non-native/invasive species cheatgrass (*Bromus tectorum*). In more mesic sites, aspen (*Populus tremuloides*) may intergrade with this community.

Besides the occasional road and small pockets within larger stands of sagebrush that are subject to mechanical treatment, the mountain shrub community exhibits no evidence of disturbance in the recent past. Where this community is over-mature, it is largely impenetrable to larger wildlife such as deer and elk.

3.6.3 Grassland Community

The grassland community covers approximately 523.7 acres, or 10.8 percent of the vegetation in the Project Area. This community is predominately an early-seral community found in the flat uplands where natural 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, Sandberg bluegrass, prairie pepperweed (*Lepidium densiflorum*), and the non-native/invasive species cheatgrass and Japanese brome. Shrubs that 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 subtypes based on whether or not the area was subject to a *burn in the past*, or is naturally lacking a shrub component or was naturally burned in the past (Grassland). The *burn* 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 burn* areas now contain enough reinvading sagebrush to be classified as sagebrush, but the more recent areas exhibit only a few plants and therefore, 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.

3.6.4 Bottomland Community

The bottomland community covers approximately 148.5 acres, or 3.1 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 / 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, thickspike wheatgrass (*Agropyron dasystachyum*), Japanese brome, and cheatgrass.

3.6.5 Aspen Woodland Community

The aspen woodland community covers approximately *24.1* acres, or 0.5 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 aspens, common species include mountain brome (*Bromus marginatus*), blue wild rye (*Elymus glaucus*), bluegrass (*Poa agassizensis*), and nettleleaf giant hyssop (*Agastache urticifolia*), mountain snowberry, and chokecherry (*Prunus virginiana*).

The aspen community 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 more normal aspen tree overstory in the near future. Elk wallows (some up to an acre in size) were found in nearly all of the dense aspen stands south of the Project Area.

3.6.6 Juniper Shrub Community

The juniper shrub community covers approximately *41.7* acres, or 0.9 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.*, mostly *monosperma*), Wyoming big sagebrush, mountain big sagebrush, mountain snowberry, crested wheatgrass, cheatgrass, Sandberg wheatgrass, and western wheatgrass.

The juniper shrub community is visually dominated by healthy juniper trees with assorted shrubs, grasses, and forbs occupy 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 are expanding into both the mesic and xeric sagebrush areas that are adjacent to this community type.

3.6.7 Other Communities

The remaining mapped vegetation communities (cultivated fields, disturbed areas, and improved pastures) cover a total of *17.2* acres, or 0.3 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.

3.6.8 Noxious Weeds

Noxious weeds are those species that 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 in 2005, a total of seven noxious weed species were observed. Those species include lesser burdock (*Arctium minus*), whitetop (*Cardaria draba*), musk thistle (*Carduus nutans*), field bindweed (*Convolvulus arvensis*), houndstongue (*Cynoglossum officinale*), and common mullein (*Verbascum thaspsus*). 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. In one instance where quantities were high enough to be detected, the species present was Canada thistle within a wetland community.

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 Project Area (**Section 3.6**). The results of those surveys are presented below.

3.7.1 Wetlands

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 followed the USACE Corps of Engineers Wetlands Delineation Manual (USACE *1987*). A total of nine jurisdictional wetlands were found within the vegetation Project Area, totaling approximately 47.9 acres. The size of these wetlands ranged from less than 0.5 acres in size to over 6 acres (Cedar Creek 2006). Wetlands mapped as part of the National Wetlands Inventory within the Project Area totaled 20.3 acres.

Streamside wetlands form the bulk of the wetland acreage across the Project Area. Excluding the 19.8 acres comprised of the six largest wetlands, streamside wetlands account for a total of 28.0 acres. Of this, 3.4 acres consist of narrow, linear streamside wetlands typically found higher in the Project Area watershed. Larger, more expanded streamside wetlands typically found lower in the Project Area occupy a total of 24.7 acres.

The wetlands along the Project Area stream courses 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 wetlands are typically heavily vegetated herbaceous meadows to moist meadow communities because they receive moisture from later subirrigations along the stream channel. On occasion, wetlands developing along the margins of older, more stable stock tanks exhibit emergent wetland communities.

3.7.2 Waters of the U.S.

During surveys for wetlands, Waters of the United States (WOTUS) were also noted and delineated. WOTUS are defined under 40 CFR 230.3[11] 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;*
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:*
    1. *Which are or could be used by interstate or foreign travelers for recreational or other purposes; or*
    2. *(From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or*
    3. *Which are used or could be used for industrial purposes by industries in interstate commerce;*
4. *All impoundments of waters otherwise defined as waters of the United States 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 waters of the United States.*

Waters of the United States 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 Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

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. According to the wetland survey and the definitions provided above, WOTUS exist in several drainages that occur within the Project Area. West Fork Jubb Creek, East Fork Jubb Creek, and Little Collom Gulch account for a total of 5.9 miles (9.5 km) of preliminary WOTUS in the Project Area.

[11] The definition of WOTUS was revised in 40 CFR 328.3 which was effective August 28, 2015. However, due to pending litigation in a number of states, including Colorado, the USACE is continuing to implement 40 CFR 230.3 and that rule's definition of WOTUS.

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 (OHWM) of the waters to the limit of the adjacent wetlands. Wetlands located along the creeks were identified based on field surveys.

3.8 FISH AND WILDLIFE RESOURCES

The wildlife habitat located within the Project Area is predominately (75 percent) 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. Wildlife commonly found in the Project Area are discussed below.

3.8.1 Mammals

Many mammal generalist species occur in 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 are 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 2011).

Habitat for bat species 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 2011).

3.8.2 Big Game

Elk (*Cervus elephus*) and mule deer (*Odocoileus hemionus*) are regularly found in the Project Area. Aerial surveys for elk and mule deer 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 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).

A five-year average of annual aerial winter counts (January 2004 to January 2008) resulted in a population estimate of approximately 500 elk located specifically in the Collom Gulch area (D. Finley, CPW, personal communication). This average includes counts from both severe and mild winters, and should not be considered a total count of the elk that winter in the area at any specific time. Elk abundance and distribution in this region can vary dramatically depending on the severity of the winter.

Elk seasonal ranges within the Project Area include winter concentration areas, production areas, and areas that resident elk may use year-round (**Figure 3-7**). CPW data indicate that the entire Project Area is both summer and winter range for elk. Resident elk range is located on the south side of the Project Area and totals 1,121.1 acres (23.*1* percent of the Project Area). Elk production areas within the Project Area overlap the resident elk range and have the same total acreage. There were no summer concentration areas mapped by CPW, but there are areas of winter concentrations in the northern portion in the Project Area, which totals approximately *2,479.5* acres (51.*2* percent of the Project Area). There is also approximately *1,278.9* acres of elk severe winter range within the Project Area (26.2 percent of the Project Area) in the west, north, and east. 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, up to one acre in size (Cedar Creek 2006).

3.8.2.2 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 (December 2003 to December 2007) resulted in a population estimate of approximately 300 mule deer located specifically in the Collom Gulch area (D. Finley, CPW, personal communication). This average includes counts from both severe and mild winters, and should not be considered a total count of the deer that winter in the area at any specific time. Based on the CPW estimates, fewer mule deer winter in the area compared to elk. However, like elk, deer abundance and distribution in this region can vary dramatically year-to-year depending on the severity of the winter.

Three types of mule deer range occur within the Project Area (**Figure 3-7**). All of the Project Area is mule deer summer range. Mule deer winter range is located on the middle and upper two-thirds of the Project Area and totals approximately *4,069.5* acres (84.*1* percent of the Project Area). The northern half of the Project Area contains approximately 2,*830.1* acres (58.*5* percent of the Project Area) of winter concentration area. Seasonal use of the Project Area would be dependent on snow levels, which vary from year to year. There are no major mule deer migration corridors in the Colowyo expanded permit boundary area, but there is one area to the northeast. 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. Deer are known to heavily use previously mined areas that have been reclaimed as grasslands (Colowyo 2011).

3.8.2.3 Pronghorn Antelope and Moose

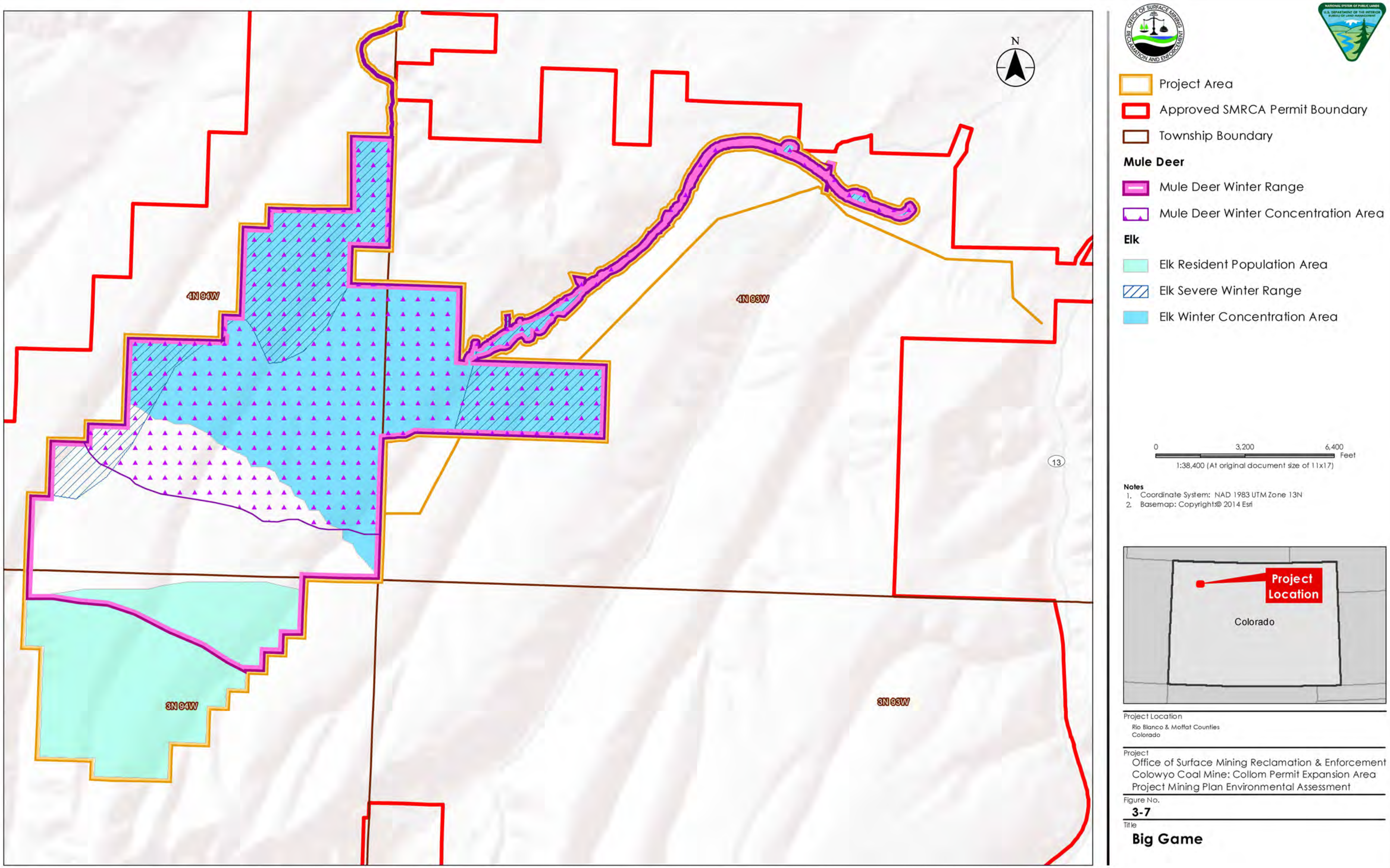
The Project Area occurs within the A-34 unit for pronghorn antelope. In 2014, this unit had an estimated population of 330 individuals, or approximately 0.6 percent of the statewide population (CPW 2015a). Of the mapped habitat for this species, approximately *2,005.3* acres (41*.4* percent of the Project Area) is designated as year round habitat.

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.

3.8.3 Migratory Birds

The Migratory Bird Treaty Act (MBTA) 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 MBTA (916 USC 703-711) provides protection for 1,007 species of native migratory birds. 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. A total of ten species on the BCC list have been, or could be, observed in or near the Project Area (**Table 3.8-1**).

As the majority (84 percent) of the Project Area is either sagebrush or mountain shrub habitat, the migratory birds found in the Project Area are generally representative of those habitats. A total of 70 species of birds have been observed in the Project Area with many other species potentially occurring. In sagebrush areas, common species include Brewer's sparrow (*Spizella breweri*), brown-headed cowbird (*Molothrus ater*), chipping sparrow (*Spizella passerina*), horned lark (*Eremophila alpestris*), lark sparrow (*Chondestes grammacus*), loggerhead shrike (*Lanius ludovicianus*), mountain bluebird (*Sialia currucoides*), sage sparrow (*Amphispiza belli*), and sage thrasher (*Oreoscoptes montanus*). In the mountain shrub habitat, common species include American robin (*Turdus migratorius*), black-capped chickadee (*Poecile atricapillus*), dark-eyed junco (*Junco hyemalis*), and green-tailed towhee (*Pipilo chlorurus*) (BLM 2006).



Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.
3-7

Title
Big Game

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

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 and	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
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**

Grassland species that may occur include horned lark, bobolink (*Dolichonyx oryzivorus*), mountain plover (*Charadrius montanus*), and vesper sparrow (*Pooecetes gramineus*). Scattered forested areas (aspen and pinyon-juniper woodlands) occur in the Project Area. Species that may occur in these areas include black-capped chickadee, hermit thrush (*Catharus guttatus*), northern flicker (*Colaptes auratus*), orange-crowned warbler (*Vermivora celata*), and pinyon jay (*Gymnorhinus cyanocephalus*). There is limited habitat for wetland bird species to occur. Potential species that may occur include Bell's vireo (*Vireo bellii*), Abert's towhee (*Pipilo aberti*), black swift (*Cypseloides niger*), and yellow warbler (*Dendroica petechia*). Given the general lack of habitat, there is no nesting habitat (e.g., cottonwood trees) for riparian-dependent species such as the *western yellow-billed cuckoo (*WYBC*)* (*Coccyzus americanus*) (Colowyo 2011).

3.8.4 Raptors

Raptor surveys have been conducted in the Project Area in 2006, 2007, 2008, and 2011. In those surveys, the following species were identified as nesting within or near the Project Area (Figure 15B in the PAP): Cooper's hawk (*Accipiter cooperii*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), prairie falcon (*Falco mexicanus*), 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 (*Buteo swainsoni*) (Cedar Creek 2011).

Bald and golden eagles are protected under the MBTA and the Bald and Golden Eagle Protection Act. CPW recommends no surface occupancy (NSO) (beyond that which historically occurred in the area) within a 0.25 mile (0.4 km) radius of an active golden eagle nest. CPW also recommends seasonal restriction to human encroachment within a 0.5 mile (0.8 km) radius of active nests from December 15 through July 15.

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. During the surveys mentioned above the number of occupied raptor nests within the entire Colowyo Coal Mine boundary have ranged between 6 in 2007 (Cooper's hawk, golden eagle, and red-tailed hawk) and 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 eight nests have been identified within the Project Area, although none were active in 2011. The nearest active nest is located approximately 1,900 feet southeast of the Project Area and was used by a red-tailed hawk.

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 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 boreal chorus frog (*Pseudacris triseriat maculata*) and northern leopard frog (*Rana pipiens*).

3.8.6 Fisheries

The Project Area does not contain perennially flowing waters and therefore does not support any fisheries. The nearest perennial water is Wilson Creek, which is a perennial stream at the proposed haul road/power line crossing. Wilson Creek has not been identified as a fishery stream. The Yampa River is the nearest waterbody with fisheries and is located approximately 7 miles (11.3 km) north of the mine boundary. Fish present in the Yampa River are discussed in **Section 3.9.1.1.**

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 (BA) and resulting Biological Opinion (BO) for *PR03* as approved in *2013*. **Table 3.9-1** lists the federal, state, and BLM sensitive species that are recorded for Moffat County.

Table 3.9-1 Federal, State, and BLM Sensitive Species in Moffat County

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	*Strix occidentalis*	Threatened	SE	
	WYBC	*Coccyzus americanus*	Threatened	SC	
	Ferruginous hawk	*Buteo regalis*		SC	Yes
	Greater sage-grouse	*Centrocercus urophasianus*		SC	Yes
	Mountain plover	*Charadrius montanus*		SC	Yes
	Greater sandhill crane	*Grus canadensis tabida*		SC	
	Bald eagle	*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

Group	Common Name	Scientific Name	Federal Status	State Status	BLM Sensitive
Birds	White faced ibis	*Plegadis chihi*			Yes
	American white pelican	*Pelecanus erythrorhynchos*			Yes
	Brewer's sparrow	*Spizella berweri*			Yes
Fish	Bonytail	*Gila elegans*	Endangered		
	Humpback chub	*Gila cypha*	Endangered	ST	
	Roundtail chub	*Gila robusta*		SC	Yes
	Colorado River cutthroat trout	*Oncorhynchus clarkii pleuriticus*		SC	Yes
	Colorado pikeminnow	*Ptychocheilus lucius*	Endangered	ST	
	Razorback sucker	*Xyrauchen texanus*	Endangered	SE	
	Bluehead sucker	*Catostomus discobolus*			Yes
	Flannelmouth sucker	*Catostomas latipinnis*			Yes
	Mountain sucker	*Catostomas platyrhychus*		SC	Yes
Mammals	Canada lynx	*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	*Spiranthese diluvalis*	Threatened		

SE - State endangered
ST - State threatened
SC - State species of concern

3.9.1 Threatened, Endangered, and Candidate Species

As required by Section 7 of the ESA, Colowyo conducted formal consultation with the USFWS on September 4, 2012, to determine the potential effects of the proposed Project on threatened and endangered species. The resulting BO from the USFWS issued on October 30, 2012, (**Appendix C**) stated that the Proposed Action would have no effect on the following species: Mexican spotted owl, WYBC, North American wolverine, Canada lynx, black-footed ferret, or Ute ladies'-tresses. No circumstances have changed between PR03 and PR04 that would alter these conclusions; as such, these species will not be discussed further with the exception of the WYBC. Reinitiation of Section 7 consultation with the USFWS has been initiated and includes the Colorado River fish species and the WYBC. Although there is no habitat for the WYBC *or the Colorado River Fish* in the Project Area, there is the potential for indirect effects on *these* species.

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. Information on these four species is summarized from the BA developed for *PR03* in 2012 with a final BO issued in 2012, and from the formal consultation conducted in 2015 for the South Taylor/Lower Wilson expansion submitted in 2015(OSMRE 2012 and USFWS 2015).

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 found only in the upper basin of the Colorado River (above Lake Powell). Three wild populations of Colorado pikeminnow are found in about 1,090 miles (1,754.2 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 rarely 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 preferring slower eddies and pools downstream to below the Hoover Dam site; 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 critical habitat for the four Colorado River fish species is found within the Yampa River (**Figure 3-8**). 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 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 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. On January 10, 2005, the USFWS issued a final programmatic BO (PBO) on the *Management Plan for Endangered Fishes in the Yampa River Basin* (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.

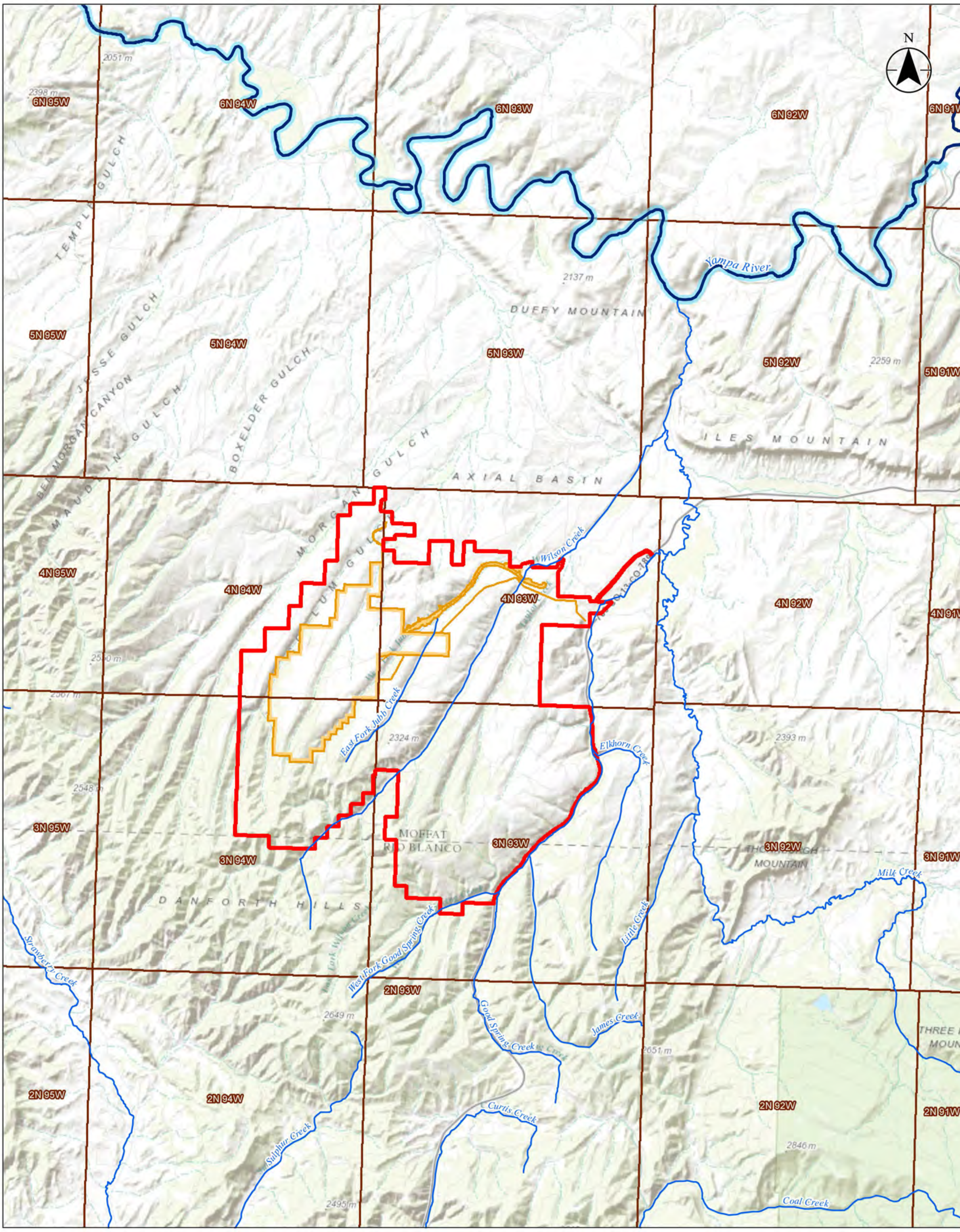
2. A fee to fund recovery actions will be submitted as described in the proposed action for new depletion projects greater than 100 acre-feet/year. The 2007 fee is $17.24 per acre-foot and is adjusted each year for inflation.

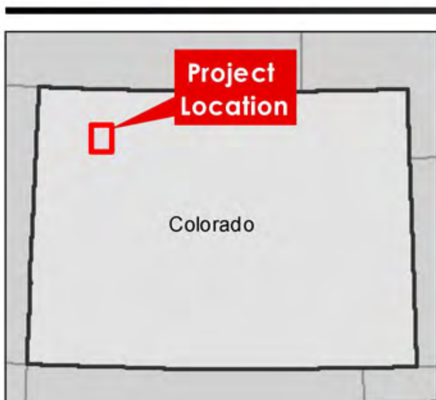
3. Re-initiation stipulations will be included in all individual consultations under the umbrella of this programmatic BO.

4. USFWS and project proponents will request that discretionary federal control be retained for all consultations under this programmatic BO.

3.9.1.2 Western Yellow-billed Cuckoo

The WYBC 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).





Stream

River

Colorado River Fish Habitat

Approved SMCRA Permit Boundary

Project Area

Township Boundary

0 1.5 3 miles

1:140,000 (At Original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance

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Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

3-8

Title

Colorado River Fish

WYBCs 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 WYBC 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 WYBCs usually raise their own young, they are facultative brood parasites, occasionally laying eggs in the nests of other WYBCs or of other bird species (USFWS 2011a). Currently it is not known if WYBCs 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 WYBCs will use different breeding areas (78 FR 61621).

The diet of this species consists of caterpillars, moths and butterflies, 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, WYBCs 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 WYBC was formally listed as a threatened species under the ESA (79 FR 59991). To date, the last known sighting of the WYBC 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).

There is no habitat for the WYBC in the Project Area. Critical habitat for the WYBC was proposed in 2014 and includes a portion of the riparian area around the Yampa River between Craig and Hayden (79 FR 48548). The critical habitat is located approximately 16 miles (26 km) northeast of the Colowyo Coal 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 appearing 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, 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 in the Project Area, it is unlikely that this species 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, 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 County, 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 Greater Sage-grouse

The GRSG 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 GRSG in Colorado occurs in the northwestern portion of the state, with Moffat County supporting the majority of breeding populations within the region (GSGWG 2008). The population in northwest Colorado exhibited an increasing population trend from 1997-2005; 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 2015a). GRSG 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).

GIS data (CPW 2008) indicate that GRSG production areas exist throughout the Project Area, and brooding habitat occurs in the northern portion of the area and encompasses approximately 82 percent of the Project Area (*3,968.6* acres). Winter GRSG range occurs across the northern and northwestern portions of the Project Area and accounts for *85* percent (*4,111.9* acres) of the Project Area. Severe winter range is delineated to the north, outside of the Project Area and mine permit boundary. In addition to these habitat designations, approximately *3,896.6* acres of the Project Area (80.*5* percent) has been designated as PHMA and *948.0* acres (19.*6* percent) is designated as GHMA (**Figure 3-9**). PHMA areas are defined as "Areas that have been identified as having the highest conservation value to maintaining sustainable GRSG 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)

A total of seven sage-grouse leks have been documented within or near the Project Area. Of these seven, four are located within the mine permit boundary (Leks SG1 and 2, SG3, SG4, and SG7) and three are outside the boundary (leks SG5, SG8, and SG12). Leks SG1 and 2 have been combined into one location given their relative closeness to each other. Further, two leks (SG3 and SG4) are located within the Project Area. In 2015, three of the leks were active (i.e., at least one individual present within the last five years) and four were inactive. **Table 3.9-2** depicts the seven leks and their status between 2010 and 2015 (survey years).

Table 3.9-2 GRSG Lek Counts In/Near Project Area

Lek Name	Males 2010	Males 2011	Males 2012	Males 2013	Males 2014	Males 2015
Axial Basin/SG5	0	0	0	0	0	0
Gossard/ SG12	3	4	0	0	12	63
SG1 and 2/Upper Wilson[1]	0	0	0	0	No Count	0
SG3/ Collom 1[1,2]	0	0	0	0	0	0
SG4/ Collom 2[1,2]	9	15	27	26	39	48
SG7/Burn[1]	5	4	0	0	5	1
SG8/Upper Morgan	0	0	0	0	0	0

Source: CPW 2015a
[1] Located within mine permit boundary
[2] Located within Project Area

The recent increase in lek attendance (particularly for SG12 and SG4) may be attributable to relatively mild winters recently. Other leks in the Axial Basin have shown similar increases (CPW 2015a)

The Project Area and the Colowyo Coal Mine as a whole is located within the Axial Basin population of GRSG. 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 GRSG to determine their locations and habitat use. Analysis of these data showed that the ridges on the eastern and western portions of the Project Area were visited at least once by approximately 25 percent of all marked GRSG. If the ridges, located approximately 3,900 feet (1,200 meters) to the east and west of the Project Area are included, then approximately 46 percent of all marked birds have visited the area. Further analysis of the data collected shows that GRSG typically use the habitat in and around the Project Area during the breeding (March 1 to July 31) and summer (August 1 to September 30) seasons. Most GRSG will migrate north to lower elevations for the winter (B. Holmes, CPW, personal communication, February 20, 2015)

3.9.2.6 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 lack 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.

3.9.2.7 Greater Sandhill Crane

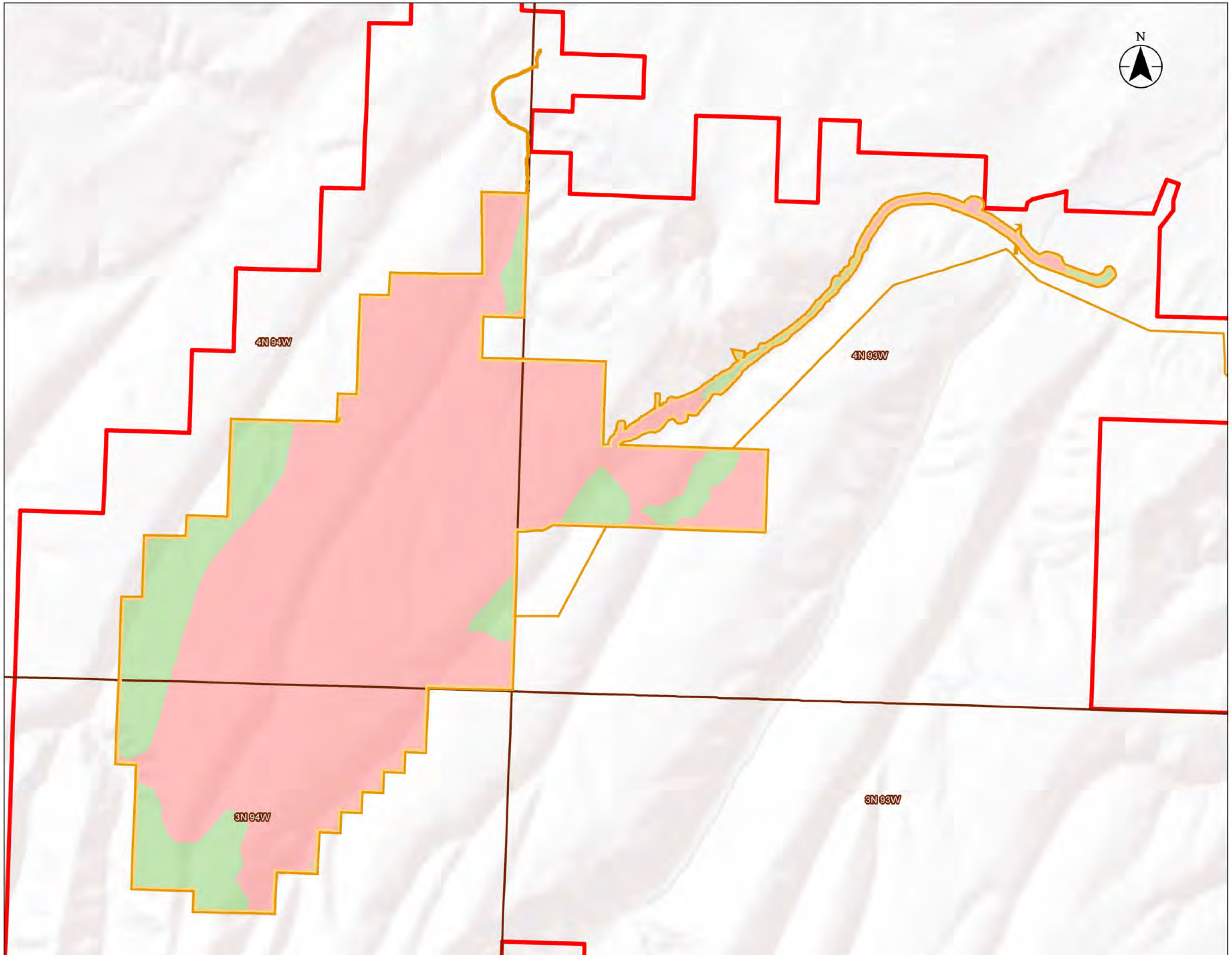
This species is listed as a species of concern for Colorado. The greater sandhill crane breeds in marshes, wet grasslands, and near beaver ponds or natural ponds lined with willow or aspens. Migrating birds forage along mudflats on reservoirs, moist meadows, and agricultural areas (BLM 2006). Habitat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

3.9.2.8 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).

3.9.2.9 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 for this species, it is not anticipated to occur in the Project Area and therefore will not be discussed further.



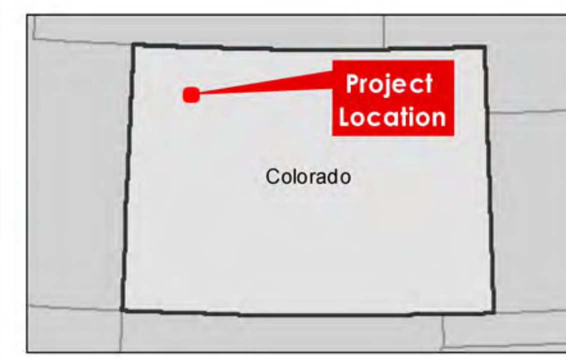
Project Area
Approved SMCRA Permit Boundary
Township Boundary

Greater Sage-Grouse Habitat

General Habitat Management Area (GHMA)
Priority Habitat Management Area (PHMA)

0 3,000 6,000 Feet
1:38,400 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Copyright:© 2014 Esri



Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.
3-9

Title
Greater Sage-Grouse Habitat

3.9.2.10 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. Two active leks and one inactive lek exist within the Project Area and several other leks are located within 2 kilometers (1.25 miles) of the 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 *3,537.5* acres of production habitat and *4,734.4* acres of winter range for this species within the Project Area (*73.1* and *97.8* 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	2006 Male Count	2007 Male Count	2008 Male Count	2011 Male Count
Leks within the Project Area				
STLek 1	1	Inactive	Inactive	Inactive
STLek 1a	0	0	0	12
STLek 2	2	Inactive	Inactive	Inactive
STLek 5				25+
Leks outside of the Project Area				
STLek 4				6
Burn	17	12	12	25
Burn 2				30+
Jubb	Inactive	Inactive	Inactive	Inactive
Jubb 2	11	7	1	Inactive
Jubb 3				10+
Wilson	Inactive	Inactive	Inactive	Inactive
Wilson 2	12	7	11	31+

3.9.2.11 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 given the lack of forested areas. Therefore, this species will not be discussed further.

3.9.2.12 Burrowing Owl

The burrowing owl is currently listed as a BLM sensitive species*, and a threatened species* 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.

3.9.2.13 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. While there are no known occurrences of this species within the Project Area, habitat does exist and this species may occur; however, there have been no reported sightings in the Project Area.

3.9.2.14 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 not likely for this species to occur and therefore will not be discussed further.

3.9.2.15 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, this species will not be discussed further.

3.9.2.16 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.

3.9.2.17 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). Given the lack of perennial water in the Project Area, this species would not occur and therefore, will not be discussed further.

3.9.2.18 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). Given the lack of perennial water in the Project Area, this species would not occur and therefore, will not be discussed further.

3.9.2.19 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. Given the lack of perennial water in the Project Area, these species would not occur, and will not be discussed further.

3.9.2.20 Townsend's Big-eared Bat

The Townsend's big-eared bat is currently listed as a species of concern for 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.

3.9.2.21 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.

3.9.2.22 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. While habitat for this species exists within and near the Project Area, 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 Proposed Action is considered an undertaking subject to compliance with Section 106 of the National Historic Preservation Act (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 be concerned about the 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's) regulations are met.

3.10.1 Cultural Context

The culture 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 F.J. Athearn (1982) and M.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). Sites 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 were conducted on the Project Area (TRC Mariah 2006a; WAS 2014). However, within the southern portion of the Mine Plan Disturbance Area, five relatively small areas have not been surveyed. These all are areas of steeply sloping terrain and were not surveyed as the likelihood of encountering sites on such terrain is low. The previous inventories recorded a total of 124 sites (TRC Mariah 2006a; WAS 2014). Of the 124 sites, 4 are eligible for the NRHP and 10 need more data to determine their NRHP eligibility (SHPO 2013). The majority (110) of the sites were recommended as not eligible for inclusion on the NRHP and need no further management. Only the NRHP-eligible and "needs data" sites are carried forward in the analysis in **Section 4.10**.

3.11 AMERICAN INDIAN CONCERNS

During the consultation at the start of this EA process, the following groups were formally contacted for this project: Eastern Shoshone Tribe, Ute Mountain Ute Tribe, Ute Indian Tribe, and the Southern Ute Tribe. The only response came from Southern Ute Indian Tribe and they stated that the proposed project would have no effect to properties of religious or cultural significance. A follow up consultation letter was sent on January 15, 2015 to the same tribes. No response was received.

Within this area of Colorado, Native American consultations on a variety of project types have revealed several site types of concern. These include prehistoric and historic Native American rock art, eagle traps, vision quests, prehistoric cairns, and prehistoric trails.

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 counties; ethnic distribution is discussed in **Section 3.13**.

Table 3.12-1 Population Estimates

County	2000 Census	2010 Census	2014 Estimate
Moffat	13,184	13,795	12,928
Rio Blanco	5,986	6,666	6,707

Source: Census 2014, CensusViewer 2015

Per capita income for the two counties has risen between 29 and 59 percent between 2000 and 2013 while throughout the State of Colorado it has risen 29 percent (**Table 3.12-2)**. The mean household income for the two counties has risen between 50 and 88 percent, compared to the state average of 66 percent between 2000 and 2013 (**Table 3.12-3**) (Census 2000, Census 2013a). 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

County	2000 Estimate	2013 Estimate	Percent Change
Moffat	$18,540	$24,577	33
Rio Blanco	$17,344	$27,586	59
State of Colorado	$24,049	$31,109	29

Source: Census 2000, Census 2013a

Table 3.12-3 Mean Household Income

County	2000 Estimate	2013 Estimate	Percent Change
Moffat	$41,528	$62,411	50
Rio Blanco	$37,711	$71,206	88
State of Colorado	$47,203	$78,383	66

Source: Census 2000, Census 2013a

In 2013, the largest employment industries for the two counties were educational and health care service; forestry, mining and oil and gas extraction (13 and 24 percent for Moffat and Rio Blanco counties, 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 (Census 2013b).

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 of Craig (Moffat County) and Meeker (Rio Blanco County) 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). The Colowyo Coal 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 the Colowyo Coal 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 $19,768,000 and regional purchases (northwestern Colorado and southwestern Wyoming) of $39,934,000 (Tri-State 2015b).

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 in property taxes. Of that, $1,259,907 was paid to Moffat County, and $142,630 was paid to Rio Blanco County (Tri-State 2015b).

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 2015b). 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 in severance taxes (Tri-State 2015b). The State of Colorado collected $245,087,355 in severance revenue in 2014 (CDOR 2014).

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 RESOURCES

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 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).

3.14.2 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.

3.14.3 Project Area Visual Resources

<u>VRM Classes</u>

The BLM LSFO RMP (BLM 2011) classified all public lands within the Project Area as VRM Class IV, which allows for major modification of the existing character of the landscape.

<u>Description of Visual Resources of the Project Area</u>

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.

<u>Night Skies</u>

Night sky resources include stars, constellations, comets, meteor showers, and other similar astronomical features or phenomena that are typically best viewed during nighttime hours. Urban sky glow, a type of light pollution, which brightens the night sky, is responsible for diminishing the ability to observe night sky resources in inhabited areas or areas with excessive lighting. Light that is emitted upward and laterally from outdoor artificial lights scatters through the atmosphere and causes a loss in night sky visibility.

The Colowyo Coal Mine is the only source of light visible at night in the area. The mine utilizes lights on trucks and at the facilities area, Gossard loadout, South Taylor pit parking lot, and employee building seven nights per week, all night long. Mine lighting is visible from several locations along Highway 13 and Moffat County Roads 17, 51, and 32, and would also be visible from the air and from surrounding elevations that are higher than the mine.

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 Moffat County Road 51 east of the Project Area and Moffat County Roads 17, 32, and 133 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 Area 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 Project Area includes both public and private lands. 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 County. In the LSFO RMP, seven 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 LSFO RMP, off-road vehicle (OHV) use on BLM land in the Project Area is limited to existing roads and trails.

The RMP defines a variety of dispersed recreational activities in Moffat and Rio Blanco Counties. The dominant recreational activity in rural Moffat County, and the Project Area, is hunting. Camping and OHV use 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 permit 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.

Within the Colowyo Coal Mine boundary and the Project Area, no public hunting is allowed although Colowyo allows its employees and their families to hunt on certain parcels owned by Colowyo within the permit boundary. In general, publicly owned lands (i.e., USFS or BLM-administered federal lands and state school sections) are open to hunting if legal access is available. Within the Project Area, all BLM-administered parcels are surrounded by Colowyo-owned land and no access is 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. The Cretaceous 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 Williams Fork formation is classified as PFYC Class 5. 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 Coal 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 4:00 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 2-1**) 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 would pass through the Moffat Tunnel and deliver coal to the eastern slope of Colorado. Coal heading west of this intersection would 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 or mining activity within the Project Area, no CCRs are generated. Non-coal, nonhazardous solid waste, such as garbage, used tires, etc., is stored in a controlled manner associated with the current Colowyo Coal Mine, outside of the Project Area in various waste receptacles and waste locations.

Colowyo's status as a conditionally exempt small quantity generator of hazardous materials under the Resource Conservation and Recovery Act essentially indicates that Colowyo generates negligible amounts of hazardous waste. Hazardous wastes produced by current mining activities at the mine are also handled in compliance with regulations promulgated under the 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 (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 (A-weighted decibel). The dBA 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 dB 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) has 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, wildlife, and livestock grazing in the area. At times, noise could potentially be heard associated with the adjacent active mining operation to the east, including blasting, coal loading/conveyance, crushing, and vehicle noise. Gun shots may be heard during hunting season or from target practice, as well as vehicles traveling on the nearby county or private roads.

3.20 LIVESTOCK GRAZING

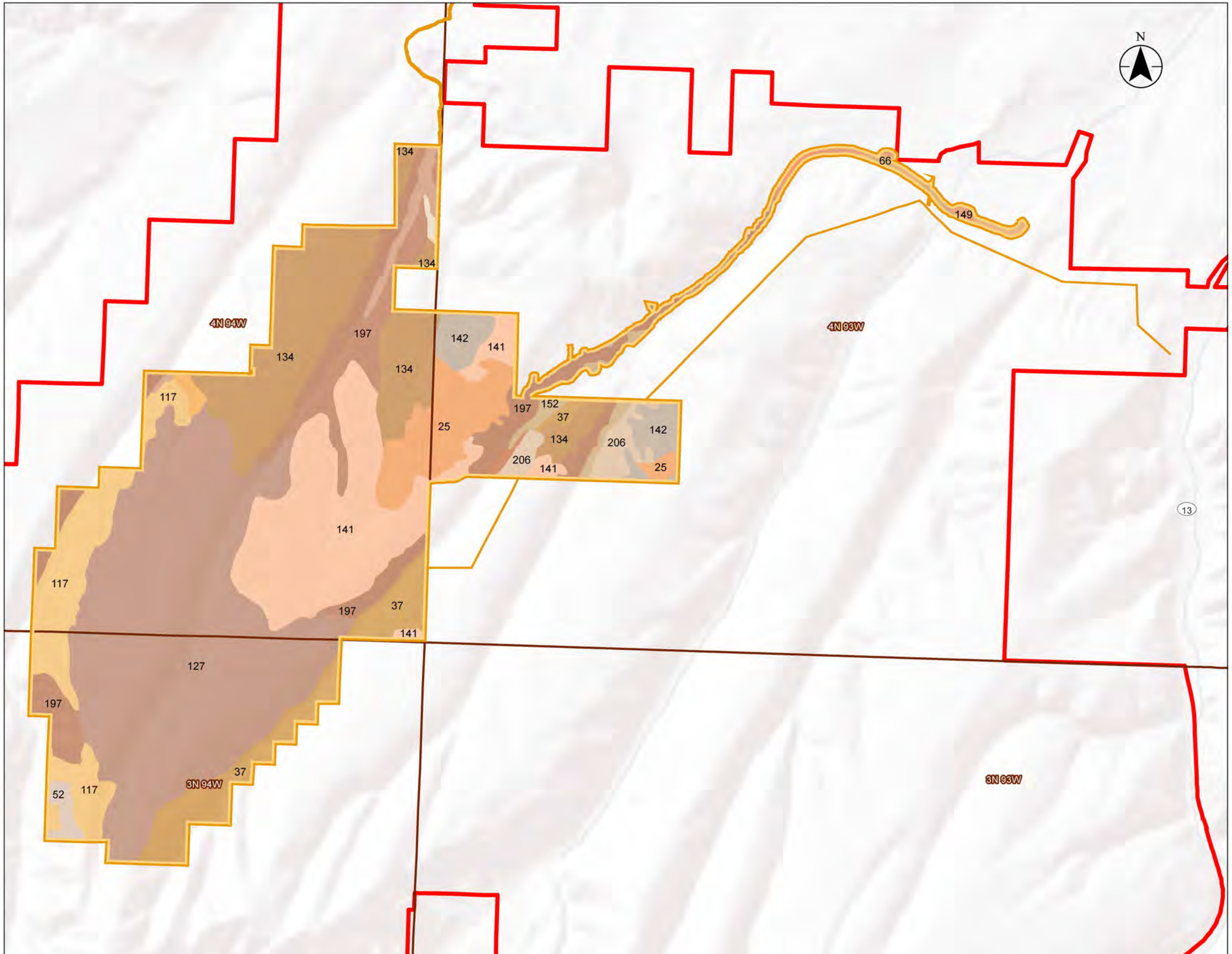
Public rangelands administered by the BLM are used for livestock grazing and wildlife habitat. The Project Area overlaps *4,712* acres of the 35,572-acre Colowyo Common grazing allotment. Animal unit months (AUMs) are allocated to each grazing allotment; AUMs are defined as the amount of forage required to support one cow and her calf (if under six months) or five sheep and their lambs (if under six months) for one month. Approximately 22 percent of the Colowyo Commons Allotment is public land administered by the BLM that provide 520 AUMs. There are 68 of these AUMs within the Project Area. Grazing management must adhere to the BLM's Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado (BLM 1995). Colowyo holds the BLM grazing permit but subleases the grazing rights to a third party.

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 is used to describe the various mapping units below (NRCS 2005).

A total of 20 soil types were mapped within the Project Area (**Figure 3-10**). Only the top 10 soil types are described below. These 10 soil types account for approximately 97 percent of the Project Area.



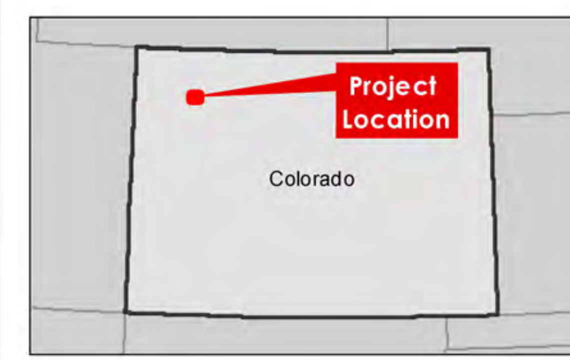
Project Area
Approved SMCRA Permit Boundary
Township Boundary

Soil Type

- 10: Battlement fine sandy loam, 0 to 3 percent slopes
- 112: Kemmerer-Moyerson complex, 20 to 40 percent slopes
- 113: Kemmerer-Yamo complex, 5 to 30 percent slopes
- 117: Lamphier-Jerry complex, 25 to 65 percent slopes
- 127: Maudlin-Duffymont complex, 3 to 15 percent slopes, very stony
- 134: Morapos loam, 3 to 12 percent slopes
- 141: Nortez, cool-Morapos complex, 3 to 12 percent slopes
- 142: Nortez, cool-Morapos complex, 12 to 25 percent slopes
- 149: Pinelli loam, 3 to 12 percent slopes
- 152: Pinridge loam, 1 to 12 percent slopes
- 194: Tolman-Duffymont complex, 10 to 30 percent slopes, extremely stony
- 197: Torriorthents-Rock outcrop, sandstone complex, 25 to 75 percent slopes
- 206: Ustorthents, frigid-Borolls complex, 25 to 75 percent slopes
- 216: Yamo loam, 3 to 15 percent slopes
- 217: Yamo loam, 15 to 30 percent slopes
- 25: Campspass fine sandy loam, 3 to 12 percent slopes
- 26: Campspass fine sandy loam, 12 to 25 percent slopes
- 37: Cochetopa loam, 12 to 25 percent slopes
- 52: Danavore-Waybe complex, 5 to 30 percent slopes
- 66: Evanot loam, 1 to 12 percent slopes
- 70: Fluvaquents and Haplaquolls soils, frequently flooded

0 2,000 4,000 Feet
1:38,400 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Copyright:© 2014 Esri



Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.
3-10

Title
Soils

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 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 117 - Lamphie-Jerry Complex, 25 to 65 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. Forty-five percent of the mapping unit is Lamphier and similar soils; 30 percent is Jerry and similar soils, and 25 percent minor components. Lamphier soils are fine-loamy, mixed Pachic Cryoborolls, while Jerry soils are fine, montmorillonitic Argic Cryoborolls derived from colluvium and residuum derived from sandstone. Both soils are well-drained and deep. The minor soils are moderately deep soils and similar soils, Skyway and similar soils, Danavore and similar soils, and rock outcrop.

Map Unit 127 - Maudlin-Duffymont complex, 3 to 15 percent slopes, very stony

The elevation for this mapping unit is 6,500 to 8,000 feet amsl. Annual precipitation is 16 to 18 inches and the frost-free period is 65 to 85 days. Fifty percent of the mapping unit is Maudlin and similar soils, 30 percent is Duffymont and similar soils, and 20 percent are minor components. Maudlin soils are fine-loamy, mixed Typic Argiborolls and Duffymont soils are loamy-skeletal, mixed Lithic Haploborolls. Both soils are well drained and moderately deep to shallow. The minor soils are Tolman and similar soils, Hesperus and similar soils, Nortez and similar soils, and Morapos and similar soils.

Map Unit 134 - Morapos loam, 3 to 12 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. Morapos and similar soils make up 85 percent of this mapping unit with minor components making up the remaining 15 percent. Morapos soils are derived from shale and in loess. This soil type is well drained. The minor soils are Nortez and similar soils, and Campspass and similar soils.

Map Unit 141 - Nortez, cool-Morapos complex, 3 to 12 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 Iles and similar soils.

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 152 - Pinridge loam, 1 to 12 percent slopes

The elevation for this mapping unit is 6,400 to 7,200 feet amsl. Annual precipitation is 13 to 15 inches and the frost free period is 75 to 95 days. Pinridge and similar soils account for 90 percent of this unit while minor components account for 10 percent. Pinridge soil is derived from sedimentary rock and is well drained. The minor components include Lander and similar soils and Battlement and similar soils.

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 from 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 are 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.

3.22 PRIME FARMLANDS

CDRMS has determined that no prime farmlands exist within the Project Area (CDRMS 2013a). 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 permit area; 2) Colowyo consultation with NRCS in 2002 and again in 2011 confirmed that no soil units meeting the regulatory definition of Prime Farmland are located within the Project Area; and 3) CDRMS review of the following NRCS Web Soil Survey website: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

Therefore, Prime Farmlands will not be discussed further in this EA.

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.; 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 Colorado Surface Coal Mining Reclamation Act (34-33-101 et seq., C.R.S. 1973 as amended) and the Regulations of the Colorado Mined Land Reclamation Board (MLRB) for Coal Mining (2-CCR 407-2), "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. "Unconsolidated stream-laid deposits holding streams" is further defined by the MLRB's Regulations 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 AVFs do exist, the SMCRA requires that CDRMS then determine whether the proposed mining operations may affect the AVF, or the waters that supply it. If the AVFs or associated water sources may be affected, CDRMS may then 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.

The Collom leasing EA (BLM 2006) summarized and evaluated the studies available up to that time that were relevant to determining whether AVF's existed in the area potentially affected by the Collom lease. While the EA concluded the studies would provide useful information in support of such a determination, the EA also concluded that additional information and documentation would be needed to make a final determination (BLM 2006).

As a part of CDRMS' Proposed Decision and Findings of Compliance for the Colowyo Coal Mine C-1981-019 Permit Revision No. 3 issued on April 10, 2013, CDRMS determined that portions of three drainages are considered AVFs within or adjacent to Colowyo's proposed mining operations. One of the drainages is located outside the permit area and CDRMS determined it would not be affected by Colowyo's proposed mining operations. CDRMS also found that Colowyo's proposed surface mining operations: 1) would not interrupt, discontinue or preclude farming on the AVFs that are irrigated or naturally sub-irrigated; 2) would not materially damage the quantity or quality of water in the surface or ground water system described above; and 3) would comply with the requirements of the Colorado Surface Coal Mining Reclamation Act of 1973 and state regulations with respect to AVFs. Further, CDRMS found that Colowyo's proposed mining and reclamation operations would be conducted in a manner that would preserve the essential hydrologic functions of the AVF outside the permit area, and that would also reestablish those functions for those AVFs within the affected area (CDRMS 2013a).

Since CDRMS, as the regulatory authority, has issued a decision that agricultural activities on identified AVFs would not be interrupted, discontinued or precluded by Colowyo's proposed mining operations, and also that the quantity and quality of the waters that supply the AVFs would not be materially damaged by those proposed operations, AVFs will not be considered further in this EA.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES (DIRECT AND INDIRECT IMPACTS)[1]

4.1 INTRODUCTION

This chapter discusses the potential physical, biological, cultural, and socioeconomic direct and indirect effects[2,3] of Alternative A (Proposed Action), Alternative B (Reduced Mining), and Alternative C (No Action) 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.

Under Alternative A, mining would occur in the Little Collom X and Collom Lite Pits in accordance with the approved mine plan (PAP and PR03 (Colowyo 2011] approved by CDRMS in 2013). Construction of new mine facilities, access roads, and other associated disturbances would occur. This would allow mining operations to occur at the Colowyo Coal Mine for an additional 19 years. Final reclamation operations, including activities such as pit backfill, final grading, placement of topsoil, and seeding, would need to be completed by 2033. Following completion of final reclamation operations, there is a 10 year bond liability period during which the progress and success of revegetation is monitored.

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1 *Italicized text denotes language inserted either in response to comments received on the EA (see **Appendix E**) or to clarify or update a topic based on new or additional information received. Each place where italicized text appears is denoted by a bar in the left hand margin.*

2 Environmental Justice, Prime Farmlands, and Alluvial Valley Floors are not discussed in Chapter 4 because these resources do not occur in the Project Area.

3 Cumulative impacts are discussed in Chapter 5.

Alternative B consists of PR03 with *pending* modifications *as applied under permit revision 04* (PR04). Alternative B would not include mining at the Little Collom X Pit, redesigns the temporary overburden stockpile associated with the Collom Lite Pit, and incorporates further GRSG Project design features. Eliminating the Little Collom X Pit from the Project reduces the life of the Project, including final reclamation operations, by four years. As under Alternative A, reclamation and revegetation monitoring would continue for 10 years after the completion of final reclamation operations, during the bond liability period.

Under Alternative C, mining would not be approved at either of the two pits, mining operations at the Colowyo Coal Mine would cease in about 2019 and final reclamation operations would then be completed. There would be no additional impacts to the environment from the mining or reclamation operations of the Project under Alternative C.

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	Alternative C
Topography	After reclamation, impacts to topography would be negligible *in the long term. There would be no indirect impacts to topography.*	Same as Alternative A.	No impacts.
Air and Climate Resources			
Direct mining criteria emissions	Negligible *long-term* impact on Colorado (0.005 to 1.74%) and U.S. (0.00004 to 0.03%) emissions. Moderate *long-term* impact on regional emissions (0.1 to 43%), but region would remain in attainment *throughout all phases of the project.*	Negligible *long-term* impact on Colorado (0.004 to 1.3%) and U.S. (0.00003 to 0.02%) emissions. Moderate *long-term* impact on regional emissions (0.03 to 31.6%), but region would remain in attainment *throughout all phases of the project.*	No impacts.
Direct GHG emissions	Negligible *long-term* impact on Colorado (0.40%) and U.S. (0.023%) total annual GHG emissions *throughout all phases of the project.*	Negligible *long-term* impact on Colorado (0.298%) and U.S. (0.0173%) total annual GHG emissions *throughout all phases of the project.*	No impacts.

Resource	Alternative A	Alternative B	Alternative C
Indirect coal combustion criteria emissions	Negligible *long-term* indirect impact on U.S. (0.0008 to 0.1314%) NEI[1]. Moderate *long-term* indirect impact on total Colorado (0.11 to 12.17%) and moderate regional (0.*06* to 10*0.5*%) emissions, but region would remain in attainment of the NAAQS. *The high percentage is based on a conservative combustion rate and not representative of current rates.* The highest pollutant percentage was for *SO_2. This impact would occur until the mine's coal resources are consumed.*	Negligible *long-term* indirect impact on U.S. (0.0007 to 0.1288%) NEI. Moderate *long-term* indirect impact on total Colorado (0.03 to *11.93*%) and moderate regional (0.*11* to *98.6*%) emissions, but region would remain in attainment of the NAAQS. *The high percentage is based on a conservative combustion rate and not representative of current rates.* The highest pollutant percentage was for *SO_2. This impact would occur until the mine's coal resources are consumed.*	No impacts.
Indirect combustion GHG emissions	Negligible *long-term* indirect impact on U.S. (0.196%) and global (0.041%) annual GHG emissions. *This impact would occur until the mine's coal resources are consumed.*	Negligible *long-term* indirect impact on U.S. (0.196%) and global (0.041%) annual GHG emissions. *This impact would occur until the mine's coal resources are consumed.*	No impacts.
Indirect coal combustion mercury deposition impacts	Minor percentage (4.4%) of the total mercury generated in Colorado. *This impact would occur long term until the mine's coal resources are consumed.*	*Minor* percentage (*4.3*%) of the total mercury generated in Colorado. *This impact would occur long term until the mine's coal resources are consumed.*	No impacts.
Ozone	Ozone NAAQS would not be exceeded *throughout all phases of the project. This would result in a minor long-term impact.*	Same as Alternative A.	No impacts.
Geology	Negligible to minor, long-term impact on the geological column.	Same as Alternative A.	No impacts.
Water Resources			
Hydrologic balance	No change.	Same as Alternative A.	No impacts.
Surface water quantity	Minor, long-term impact on stream flow by reduction in contribution of spring/seep flows.	Same as Alternative A	No impacts.
Surface water quality	Negligible*, long-term* impacts related to runoff or spills. Impacts related to TSS, iron, mercury, or selenium controlled via the existing NPDES and CDPS permits.	Same as Alternative A.	No impacts.

Resource	Alternative A	Alternative B	Alternative C
Groundwater impacts	Negligible, *long-term* impacts to groundwater.	Same as Alternative A.	No impacts.
Indirect iron, mercury, and selenium impacts from coal combustion	Negligible, *long-term* iron loadings. Incremental but unquantifiable addition to baseline mercury concentrations. Incremental but unquantifiable addition to baseline selenium concentrations.	Same as Alternative A.	No impacts.
Indirect coal combustion impacts to groundwater	Negligible, *long-term* indirect impact to groundwater related to CCRs.	Less than Alternative A but still negligible.	No impacts.
Vegetation	Negligible to moderate short-term impacts to vegetation on 43.2% of the Project Area. Reclamation would replace vegetation to approved reclamation plan (or improved) conditions.	Negligible to moderate short-term impacts to vegetation on 54.5% of the Project Area. Reclamation would replace vegetation to approved reclamation plan (or improved) conditions.	No impacts.
Wetlands	*After mitigation required under Section 404 of the CWA, minor, short*-term impact to 1.1 acres of jurisdictional wetlands *and 0.38 acres of WOTUS.*	*After mitigation required under Section 404 of the CWA, minor, short–term impact to 1.3 acres of jurisdictional wetlands and 0.24 acres of WOTUS.*	No impacts.
Wildlife			
Big game	Short-term minor to moderate impact on game range until reclamation replaced habitat to approved reclamation plan (or improved) conditions.	Same as Alternative A.	No impacts.
Migratory birds, raptors, reptiles, and amphibians	Negligible to minor *long-term* impacts.	Same as Alternative A.	No impacts.
Fisheries	No direct impacts to fisheries. See Special Status Species below for indirect effects to Colorado River fish.	Same as Alternative A.	No impacts.

Resource	Alternative A	Alternative B	Alternative C
Special Status Species	Indirect impacts to the Colorado River fish from mercury and selenium impacts would be *long term and* moderate. Indirect impacts to the WYBC would be *long-term and* minor. There would not be any direct effects to Colorado River fish or WYBC. Impacts to state-listed and sensitive species, except GRSG, would be *long* term and negligible to moderate until successful reclamation, when reclamation goals would prioritize the replacement of wildlife habitat. Impacts to *BLM sensitive species* GRSG as a result of disturbance to 1,829.4 acres of PHMA would be *long* term and major. This habitat would be available to GRSG again after reclamation. There would be moderate indirect impacts to access to brood-rearing habitat. There would be moderate to severe impacts to lek SG4 due to its proximity to the Little Collom X Pit and likely abandonment.	Indirect effects to Colorado River fish, WYBC, and state-listed and sensitive species, except GRSG, would be the same as Alternative A. There would be more acreage of PHMA disturbed, which would be short term and major until reclamation made the habitat available again for GRSG. The indirect effects to access to brood-rearing habitat would be reduced to a *long-term* minor impact. The impact to lek SG4 would be reduced to a minor impact. With the increased distance from lek SG4 to the edge of proposed disturbance, the shortened life of the Project, and the inclusion of additional design features, the impacts to GRSG under Alternative A would be *long-term* minor to moderate and would be substantially less than under Alternative A.	No impacts.
Cultural and Historic Resources	No impacts.	Same as Alternative A.	Same as Alternative A.
American Indian Concerns	No impacts.	Same as Alternative A.	Same as Alternative A.
Socioeconomics	*There would be beneficial socioeconomic impacts locally, regionally, and state-wide from continued mining over the 19-year life-of-mine.*	*The beneficial impacts would be similar to Alternative A, but would be reduced by approx. $140 million less in annual payroll, local expenditures, and taxes and royalty payments due to a 4-year shorter life-of-mine.*	*The beneficial socioeconomic impacts would continue over the life-of-mine, estimated at 4 years.*
Visual Resources	Minor short-term and long-term impacts that would still meet Class IV objectives.	Same as Alternative A.	No impacts.

Resource	Alternative A	Alternative B	Alternative C
Recreation	Negligible to minor, short-term impacts to recreation until reclamation.	Same as Alternative A.	No impacts.
Paleontology	*Impacts to paleontological resources would be none to minor and long-term.*	Same as Alternative A.	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.	The amount of noise would be the same as under Alternative A, but the elimination of the Little Collom X Pit would reduce potential noise effects to the public to negligible *and short term*.	No impact.
Livestock Grazing	Minor, long-term impact on the availability for grazing.	The impacts on grazing would be the same as those under Alternative A, but grazing would be reinstated 4 years earlier than under Alternative A.	No impact.
Soils	Minor*, long-term* impacts related to erosion and fertility loss.	Same as Alternative A.	No impact.

[1] National Emissions Inventory

4.2 TOPOGRAPHY

4.2.1 Alternative A (Proposed Action)

Under Alternative A, impacts to the local topography would occur but would vary greatly. Disturbance would occur over approximately 2,090.5 acres within the Project Area. The access road and mine facility areas are generally situated in areas with little topographical relief. Construction in those areas would generally be limited to leveling the area. Therefore, impacts to the topography from these components would be minor and *long* term until reclamation restored these areas to their approved post-mining topographies.

The impacts to topography would be greatest where the Little Collom X and Collom Lite Pits would occur. These areas account for approximately 1,694 acres of the total disturbance (Maps 18B and 19C, [Colowyo 2011]). The mine pits themselves would alter the topography by lowering the overall elevation. This *long*-term impact would likely only be noticeable near the pits themselves and would be minor. Conversely, areas where topsoil and overburden material are stored would increase the elevation in those areas. This change in the elevation would be more visible from a distance and would be short term and moderate.

As part of reclamation, the pits would be backfilled using the overburden stored in the temporary overburden stockpile. All areas disturbed by mining would be backfilled, if appropriate, then 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 *for the long term*.

4.2.2 Alternative B (Reduced Mining)

Impacts to the topography under Alternative B would be similar to those under Alternative A. However, the elimination of the Little Collom X Pit from the Project and the redesign of the temporary overburden stockpile for the Collom Lite Pit would change the location and the acreage of the impacts. Eliminating the Little Collom X Pit would result in no impacts to the topography of the northern portion of the Project Area. However, there would be an additional 546.2 acres of disturbance to topography under Alternative B compared to Alternative A due to increased disturbance associated with the redesign of the temporary overburden stockpile, Collom Lite Pit, and the Jubb Creek haul road configurations. These impacts to topography would be short term and moderate. After reclamation has been completed, as described for Alternative A, the impacts to topography would be negligible *for the long term*.

The elimination of the Little Collom X Pit would reduce the life of the Project by approximately four years. Therefore, the area would be returned to pre-disturbance conditions and topography four years sooner than under Alternative A.

4.2.3 Alternative C (No Action)

Under Alternative C, no mining would occur in the Project Area. Therefore, there would be no impacts to topographical features in the Project Area.

4.2.4 Mitigation Measures

No mitigation measures w*ould be* necessary for topography.

4.3 AIR AND CLIMATE RESOURCES

4.3.1 Introduction

4.3.1.1 Air Quality Modeling

The preparation of this EA began in September 2013 and a decision to conduct modeling of the potential air quality impacts of mining was made in December 2013. In order to start developing input data for the model*, with regard to future timing and length of potential impacts, it was determined that a mining* plan modification *would be necessary for this project which* would *need to* be approved by the ASLM. *M*ine production rates and the life of the mine *for Alternative B were determined, resulting* in the timeframe of 2014 to 2021*,* for which the model calculate*d* mine related emissions to ensure that all existing and proposed operations would be in compliance with NAAQS within the Project Area.

Emissions would be calculated for the mining and reclamation operations ongoing in late 2013 that would be expected to continue into 2014 and beyond. At that time, mining in the East Pit had terminated and reclamation operations were underway there. For the purposes of the modeling, reclamation activity in the East Pit would occur through 2016. In addition, the West and South Taylor Pits were actively being mined in late 2013, although mining in the West Pit was declining as the coal reserves were being depleted. *T*he modeling *for* mine production from the West and South Taylor pits *was* maximized during 2014 and 2015 respectively, with all reclamation activity ending in 2019 and 2021, respectively. The Little Collom X and Collom Lite Pits were proposed to be mined as described under Alternative A. Alternative A operations would begin in 2015 with construction of the Collom haul road and subsequent development and mining of the Little Collom X Pit. Then the Collom Lite Pit would be developed and production ramped up to 5.*0* mtpy within a year.

The collection of data relative to all of these existing and proposed operations for input to the air model was initiated in early 2014 and modeling began in mid-2014. Eleven scenarios of equipment allocation were analyzed and modeled for the time period 2014 to 2018, each as a hypothetical real-life situation that could occur on any given day. Similarly, ten scenarios were analyzed for 2019, three for 2020, and one for 2021. Daily and annual activity rates were derived from the number of trucks, bulldozers, scrapers, etc. that *would be used to mine at a maximum production rate of* 5.*0* mtpy.

4.3.1.2 Discrepancies between the Assumed Modeling Timeframes and the Actual Timeframes

The modeling data presented in the following sections was based in part on the operations ongoing at the time this EA was initiated, as well as on projected assumed timeframes for both the ongoing and proposed operations. Delays in the preparation of the EA have resulted in discrepancies between the assumed timeframes for certain operations in the model and their actual or potential future timeframes. For instance, the model assumed that construction of the Collom haul road would begin by mid-2015. In reality that work would not start until mid-2016 at the earliest if the mining plan modification is approved. As another example, the model assumes that the South Taylor Pit would maximize production in 2015 and would be gradually replaced by production from the Little Collom X Pit starting in 2015, followed shortly by increasing production from the Collom Lite Pit. However, production at the South Taylor Pit would need to continue well into 2016 and possibly into 2017, as long as coal reserves can be accessed, pending a decision on the mining plan modification for *PR04*. In order to maintain consistency with the assumed timeframes in the model calculations, all mine activities are discussed below in the context of their associated model assumptions, and not their actual or potential future timeframes. Therefore, the reader needs to be aware that there may be discrepancies between the assumed timeframes and the actual or potential future timeframes for the operations and activities described. Regardless of the timeline discrepancies, the modeling results were not affected.

4.3.2 Alternative A (Proposed Action)

4.3.2.1 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 the combustion of fuel in mine vehicles.

For purposes of the modeling analysis, mining operations under Alternative A would begin in 2015 with development of the Little Collom X Pit and production would increase through 2021 as the Collom Lite Pit comes into full production. Collom Lite production would be maintained at 5.1 mtpy going forward through the life of the mine. Simultaneously, the combined production from the West and South Taylor pits would be maximized during 2014 and 2015 and end in 2019 and 2021, respectively. Reclamation of the East pit would be conducted through 2016.

In-Pit Fugitive Emissions Sources

Within the West, South Taylor, Little Collom X, and Collom Lite pits (**Figure 4-1**), there would be numerous mining activities that would continue to, or would in the future, contribute to fugitive particulate emissions. These would include the use of shovels, a dragline, front end loaders for overburden and coal removal, and drilling holes for explosives. Fugitive emissions would also occur from the use of explosives for blasting to break apart overburden for removal. Mobile sources would consist of dozers (both overburden and coal), graders, water trucks, and haul trucks.

All pit areas except the *West* Pit would have a blasting component associated with them. Each blast within the South Taylor pit would utilize 700,000 pounds of ANFO and the Little Collom X, and Collom Lite pits would utilize 800,000 pounds or 400 tons of ANFO, unless restricted to ensure compliance with the NAAQS. The maximum number of annual blasts in each pit would be as follows: 476 blasts per year in *the South Taylor Pit, 106 blasts per year in the* Little Collom X Pit, and 850 blasts per year in the Collom Lite Pit.

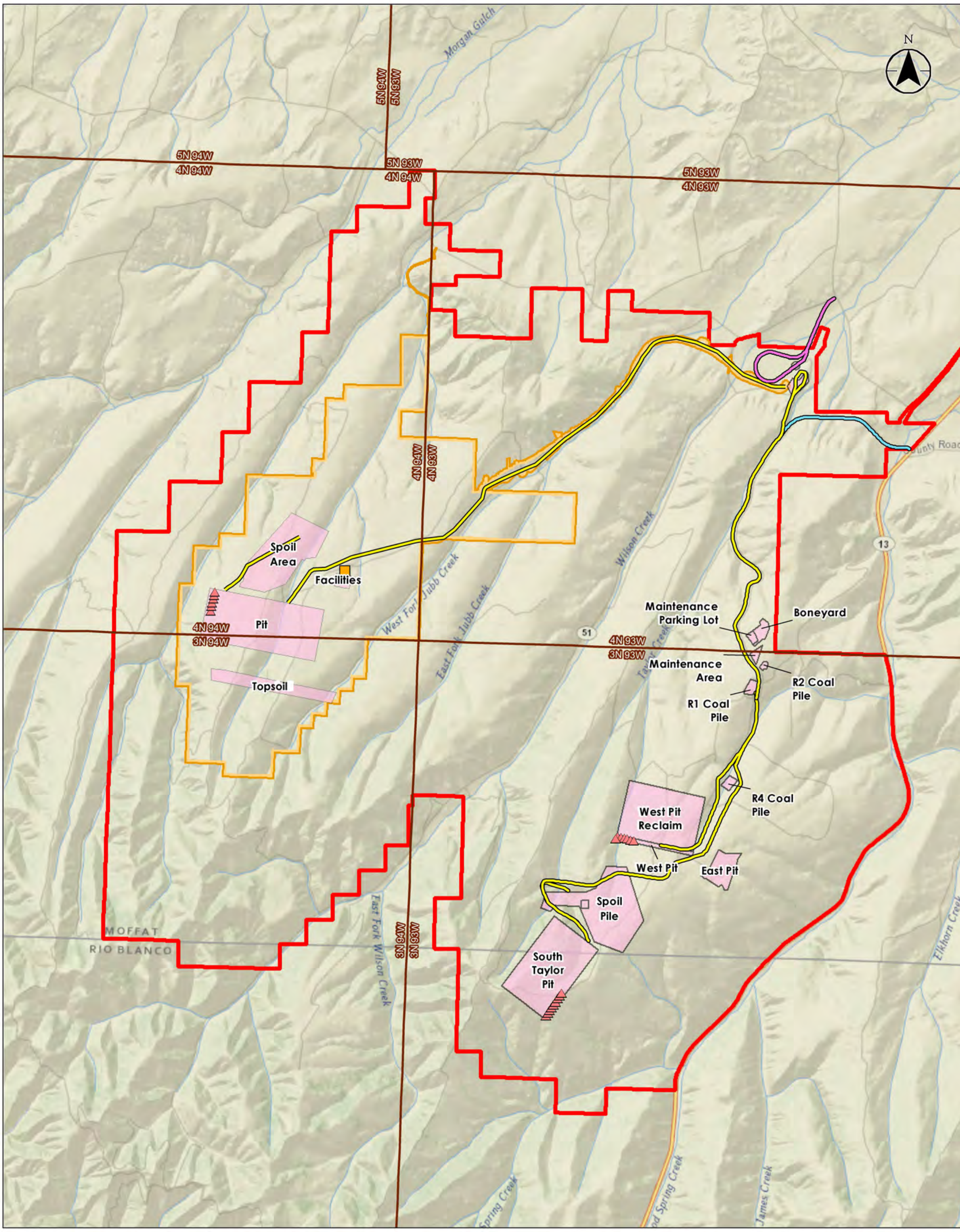
Other Fugitive Sources

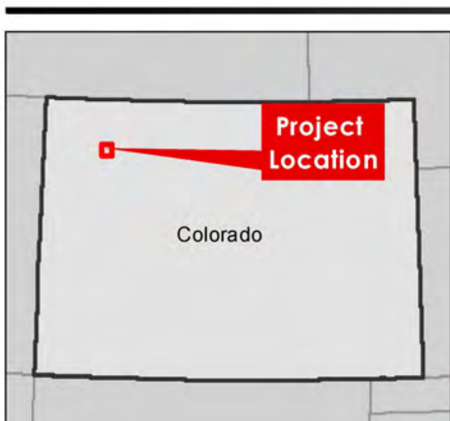
There are additional potential sources of fugitive emissions at the mine. These include several coal storage piles at various locations on the mine property (**Figure 4-1**), which would contribute windblown dust to fugitive emissions. Also, bulldozers are utilized on all of the coal piles at various times, an activity which would release additional windblown dust. General particulates would also be attributable to travel on both unpaved and paved haul roads, as well as in the maintenance parking lot and boneyard.

Other fugitive emission sources would result from the construction of the Collom haul road, the facilities complex, and the Collom sump and sediment pond (**Figure 4-1**), all of which would be constructed in the first year of the Project before mining actually begins. For the purposes of the modeling, all such one-time, construction-related fugitive emissions were factored into the *modeled year* 2015 *(first year of mining)* potential emissions.

Process Emission Sources

The Colowyo Coal Mine includes several sources of process emissions. The mine utilized both primary and secondary coal crushing facilities for the South Taylor Pit and the emissions from these facilities are included in the model for the period that the pit would be mined. Another primary crusher would be used for both of the Collom pits. The South Taylor and Collom crushers each would provide multiple sources of particulate emissions including: loading of coal into hoppers, crushing the coal; conveying coal into storage bins; and loading coal into dump trucks. In addition, coal crushing and screening operations and loading coal onto railcars for transport would contribute to overall particulate emissions and are factored into the model.





Blasting

Crusher

Access Road

Blasting

Haul Road

Rail Loop

Polygon Sources

Project Area

Approved SMCRA Permit Boundary

Township Boundary

0 3,200 6,400 Feet

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

Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

4-1

Title

Geographic Project Emissions Sources

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.

Tailpipe Emissions Sources

Tailpipe emissions result from the travel of a variety of vehicle types over the mine's roads. The mine includes an existing 1.4 mile (2.3 km) paved access road and a 3.7 mile (6.0 km) paved haul road for South Taylor and West pits. Alternative A would add a 5.3 mile (8.5 km) paved haul road for the Project. The mine access road is primarily used by employees coming to and from the mine using typical passenger vehicles, and occasional deliveries by different types of trucks. The paved haul roads are used by all trucks hauling coal, as well as occasionally by employee vehicles and delivery trucks. For the purposes of the modeling and to be conservative with this analysis, all vehicles are assumed to travel the entire length of the road for each roundtrip, which would lead to an over-estimate of the emissions generated.

Maximum emissions are estimated at an equivalent of 150 car, 75 pickup truck, and 25 delivery vehicle roundtrips per day for 305 operating days per year. It was also assumed that for 305 operating days at the South Taylor Pit there would be 606, 50 ton haul truck roundtrips per day, and for the combined Collom pits there would be 829 roundtrips. The larger 240 ton haul truck emissions are calculated based on average distances traveled within each pit, to the temporary spoil piles from the pits and return, and from the pits to the R1, R4, and Collom coal storage piles.

Water trucks, scrapers, graders, and dozers also release tailpipe emissions within the active mining pits. Additionally, dozers are operated on the G1/G2 and R1, R4, and Collom stockpiles. All emissions are included in the modeling calculations as open pit and area sources, respectively.

Hazardous Air Pollutant Emission Estimates

A 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.

4.3.2.2 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	7,156	759	3,820	24,147	0.8	2.2	5.8E-03
Process	5.2	0.8	0	0	0	0	0
Tailpipe	5.6	4.8	728	458	88.2	0.5	13.4
Total	7,167	765	4,548	24,605	89.0	2.7	13.4

When comparing gaseous criteria pollutants to state and national totals from the 2011 National Emissions Inventory (NEI)[4], Alternative A would have a negligible *long-term* impact. On a percentage basis, Alternative A would range from 0.005 percent to 1.74 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 0.00004 percent to 0.03 percent. SO_2, again, would contribute the least, and CO would have the highest percentage. All contributions *are predicted to 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 0.1 percent to 43.0 percent.

Particulate emissions would be similar. With fugitive emissions included, Alternative A would contribute 0.75 percent of the statewide $PM_{2.5}$ emissions. PM_{10} emissions associated with Alternative A would be 2.18 percent of the statewide total with fugitive emissions included. National percentages would be even less at 0.013 percent and 0.035 percent. Direct particulate emissions associated with Alternative A *are predicted to be insignificant* in comparison to Colorado and nationally. The surrounding county comparison showed that Alternative A would be a maximum of 32.1 percent of the region's particulate emissions.

The county maximum HAPs comparison of Alternative A would be 15.5 percent of the EPA 2011 NEI. The maximum HAPs emissions contributed by Alternative A would be 0.007 percent of the total HAPs emitted by the State of Colorado per the EPA 2011 NEI. Nationally,

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

9.05 million tons of HAPs were emitted in 2011 and Alternative A would contribute 0.0001 percent. The amount attributed to Alternative A *are predicted to be insignificant* by comparison.

While there would be a moderate to high contribution of emissions from Alternative A to the region, Moffat County has consistently maintained its designation of attainment. Dispersion modeling for the region supports this designation (**Section 4.3.3.3** and **Section 5.4.2.5**).

Onsite (North and Gossard) Particulate Monitoring Data

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 monitors were installed at the Colowyo Coal Mine to determine the impact of existing operations on ambient particulate concentrations. The data from these monitors does not directly represent the impact from Alternative A or B but is useful for understanding the impacts of existing operations and how they relate to the transition to the Collom expansion. Additionally, we are including these two discussions because our atmospheric dispersion modeling includes South Taylor activities during the transition to the Collom expansion. While this information does not mean these exceptional events will have the same effect on the Collom expansion, it does aid in our analysis.*

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 five, three-year segments for evaluation against the NAAQS standard (**Table 4.3-2**) as the standard is based on a three year averaging period of concentrations.

Table 4.3-2 Monitoring Station Potential High Values

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
	Aug 2011-July 2014	3
	Aug 2012-July 2015	3
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; three times between August 2011 and July 2014; and three times from August 2012 through July 2015. Between July 2011 and December 2013, concentrations at the Gossard monitor were elevated once. *The form of the 24-hr PM_{10}* NAAQS standard allows for one exceedance per year on average over *a* three year period. *As a result, the 24-hr PM10 NAAQS is only violated if the standard value is exceeded four or more times in a three year period.*

Therefore, because the total number of exceedances was less than three for each of the above mentioned segments, *none would be* considered *a* NAAQS violation.

The August 2008 through July 2011 and August 2009 through July 2012 North monitoring segments have an overlapping time period of two years (August 2009 - July 2011). As a result, any exceedances that occurred between August 2009 and July 2011 were double-counted. There were a total of eight high values between August 2008 and July 2011 (**Table 4.3-3**). Therefore, before August 2010, the number of monitored high values was greater than the allowed standard of no more than one exceedance per year averaged over three years. Colowyo addressed this situation by revising the mine's *fugitive* dust control plan *that was approved by the CDPHE APCD*.

Table 4.3-3 High Value Dates

Station	Date of Exceedance	24 Hr Average ($\mu g/m^3$)
North	11/2/2008	288
	3/4/2009	237
	3/22/2009	167
	7/6/2009	157
	9/29/2009	291
	9/30/2009	180
	12/4/2009	193
	5/28/2010	198
	5/26/2012	192
	1/29/2014	174
	1/5/2015	186
Gossard	5/26/2012	167

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 possibly 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 Coal 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 unusual or naturally occurring events are flagged as exceptional events and are not used in the determination of NAAQS attainment status. Colowyo has submitted documentation of these events are exceptional; however CDPHE has not yet reviewed the mine's exceptional events documentation nor has EPA formally approved it.

Elevated PM_{10} Events at North Site

The eight exceedance events (**Table 4.3-3**) 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 4.3-4 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 4.3-4 High Wind Days

Station	Date of Exceedance	Average Wind Speed (m/s[1])	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

[1] meters/second

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 4.3-4**). 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 possible 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 and the removal of stockpile R3 and chemical stabilization of the maintenance parking lot and boneyard, the direct emissions associated with Alternative *A* would be less likely to produce any high values in the future unless there is a regional exceptional event.

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).

Methane Emissions from Coal Extraction

Methane (CH_4) is the predominant GHG emitted from direct surface coal extraction and post-extraction handling of coal. The final methods used to determine methane emissions from coal mining and handling are included in the Intergovernmental Panel on Climate Change (IPCC) Guidelines (Irving et al 2001). 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 5.1 mtpy (4.63 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 Coal 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 *methane* emissions typically produce twice as much methane as in-situ coal (EPA 2006) *due to the methane content of the surrounding strata, therefore,* an emission factor of 0.8 m^3 CH_4/mt *is used in the calculation of methane content.* 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 4.63 mmt/year coal extraction, the total methane emitted is 2,827 metric tonnes annually. Additionally, the extraction of all 74.1 mmt (81.7 million short tons) would generate approximately 49,922 metric tonnes of methane.

Mining Combustion Gaseous GHG Emissions

The EPA regulates several GHGs, which primarily include carbon dioxide (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 *a period of* 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 carbon dioxide equivalent (CO_2e) in units of metric tons.

Utilizing EPA emissions factors and the maximum mining rate of 5.1 mtpy, the direct GHG emissions associated with Alternative A are detailed **Table 4.3-5**. 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. *To put these emissions in context,* Alternative A would contribute 0.40 percent of the statewide total and 0.023 percent nationwide. *Both of these contributions (statewide and national) would be predicted to be insignificant.*

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 black carbon 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 4.3-6**). All 240T trucks were assumed 830E Komatsu haul trucks, which all have a "2007-plus" engine. The 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 4.3-5 Direct GHG Emissions (metric tons/yr), Alternative A

Activity	CO_2	CH_4	N_2O	CO_2e
Scrapers[5]	2,993	0.17	0.08	3,020
Drills[8]	26,103	1.05	0.20	26,191
Dozers[3]	25,171	1.41	0.64	25,398
Graders[4]	131,812	7.37	3.36	132,999
Haul Trucks (240T)[6]	50,375	1.26E-02	0.01	50,379
STA Haul Trucks (50T)[7]	2,484	2.6E-03	2.4E-03	2,485
Collom Haul Trucks (50T)[7]	6,312	6.6E-03	6.2E-03	6,314
Water Trucks[1]	14,916	0.015	0.01	14,921
Blasting[2]	185,053	6.54	1.63	185,704
Access Road	62	3.58E-03	7.30E-03	64
Rail Maintenance	602	0.04	6.85E-03	605
Methane Release	--	2,827	--	70,675
Total	**445,885**	**2,844**	**6.0**	**518,754**

[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 1,200 gal diesel consumed per day

Table 4.3-6 Black Carbon Emissions (tpy) from Haul Trucks, Alternative A

Haul Truck	Black Carbon $PM_{2.5}$	Black Carbon PM_{10}
50 Ton	0.056	0.066
240 Ton	0.302	0.329
Access Road	5.39E-04	5.82E-04

4.3.2.3 Air Quality Environmental Controls for Direct Emissions from the Mine Roads

The Colowyo Coal Mine 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. *Currently, the only paved road for the Collom expansion is the Jubb Creek haul road. All other out-of-pit haul roads would be watered and dust suppression chemicals would be applied if applicable.*

Per the mine's DRMS Permit, a strict speed limit of 45 mph is implemented for all roads to control dust and to provide for safe operation of the equipment. All heavy equipment is limited to 25 mph or less for safety and dust control. This includes haul trucks, scrapers, water trucks, etc. Travel of unauthorized vehicles is prohibited onto the mine property, and overburden haul equipment is restricted to roads with appropriate capacity and structure for the equipment size and weight. In addition, *the Jubb Creek* 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. *These methods would be consistent with PR04.*

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.

The Colowyo Coal Mine 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

The Colowyo Coal Mine, 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.

4.3.2.4 Dispersion Modeling Impact Analysis

Due to the time required to complete a dispersion modeling assessment, dispersion modeling to ensure NAAQS compliance for Alternative A was not completed because Alternative A was determined to have the potential for significant impacts (for non-air resources) and as such was not likely to be selected for mine planning. Dispersion modeling was completed for Alternative B (**Section 4.3.3.3**).

4.3.2.5 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.

The Colowyo Coal Mine 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 Mine 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 Colowyo 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 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 MMBTU or quality of coal with the Craig Generating Station to which provides 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 Coal 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 4.3-7**) can be used to calculate emissions associated with coal from the Colowyo Coal 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. *Both the Craig and Hayden Generating Stations operate in compliance with their required permitting documents. A further discussion of the regional attainment of ambient standards in included in **Section 4.3.2.6**.*

Table 4.3-7 Reporting Year 2013 Criteria Emissions Data

Facility	2014 (reported year) Annual Actual Pollutant Emissions (tpy)					
	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
Craig Generating Station	172.2	121.1	1,232.8	12,091.0	3,261.0	62.2
Hayden Generating Station	148.3	67.5	385.1	6,483.6	2,330.7	49.2

Source: APENS

The maximum coal produced under Alternative A would be 5.1 mtpy, so this maximum production was used to conservatively estimate annual criteria pollutant emissions (**Table 4.3-8**). 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 factor (regional maximum), the average regional emissions factor (regional average), and using the Craig Generating Station emissions factors. Specifically, emissions factors were calculated by dividing the annual emissions total for each pollutant by the facility's total maximum firing rate (high heating value in MMBTU). This was completed for the Craig Station and Hayden Station, respectively. On a pollutant by pollutant basis, the maximum (for either location), average (average of Hayden and Craig) and Craig Station only emissions factors were then determined in lb/MMBTU. The emissions presented in **Table 4.3-8** were then calculated by multiplying the coal combustion rate in tons by the high heating value for western coal and the maximum, average, and Craig Station only emission factors.

Table 4.3-8 Predicted Criteria Emissions Data (tpy)

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	5,100,000	431.45	196.48	1,544.59	18,867.09	6,782.27	143.17
Contracted Rate	2,300,000	194.57	88.61	696.58	8,508.69	3,058.67	64.57
Regional Average							
Maximum Mining	5,100,000	323.61	174.09	1,332.61	17,008.02	5,434.01	110.54
Contracted Rate	2,300,000	145.94	78.51	600.98	7,670.28	2,450.63	49.85
Craig Generating Station Only							
Maximum Mining	5,100,000	215.77	151.70	1,544.59	15,148.96	4,085.75	77.92
Contracted Rate	2,300,000	97.31	68.41	696.58	6,831.88	1,842.59	35.14

The Hayden Generating Station emission factors were higher on a lb/MMBTU basis for PM_{10}, $PM_{2.5}$, SO_2, VOC, and NOx emission rates while the Craig Generating Station produced the higher emission factor for CO. **Table 4.3-9** 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 0.03 percent to 12.17 percent of the Colorado total NEI emissions using the regional maximum emissions factors and from 0.02 percent to 9.75 percent based on regional average emissions factors (**Table 4.3-9**). 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 0.0008 percent to 0.1314 percent of the national total NEI emissions and from 0.006 percent to 0.1184 percent based on regional average emissions calculations (**Table 4.3-9**). The emissions *are predicted to be* insignificant relative to the national emissions totals and moderate emissions relative to the Colorado emissions total. *Actual emissions at Craig Generating Station are significantly less than the projected emissions using the regional maximum or the regional average emission factors. Actual emissions were not compared to regional and national emissions totals because the higher emissions calculated from the regional maximum and regional averages were predicted to be insignificant.*

Emissions at the maximum mining rate when compared to the four surrounding counties would range from 0.11 percent to 100.5 percent. As stated above, the assumed 5. 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 0.05 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 *the area would* remain in attainment. As described in **Section 4.3.2.4**, the values from the state monitoring network are well under NAAQS compliance levels when natural exceptional events are excluded. Additionally, monitoring for PM_{10} at Colowyo has shown compliance with the PM_{10} NAAQS since January 2010. This is because the PM_{10} standard allows up to three exceedances in a 3-year period.

Table 4.3-9 Predicted Criteria Emissions Data (% NEI)

Emissions Method	Coal Combust. Rate (tpy)	PM_{10} (% of 2011 Colorado NEI)	$PM_{2.5}$ (% of 2011 Colorado NEI)	CO (% of 2011 Colorado NEI)	NO_2 (% of 2011 Colorado NEI)	SO_2 (% of 2011 Colorado NEI)	VOC (% of 2011 Colorad o NEI)
Regional Maximum							
Maximum Mining	5,100,000	0.13%	0.19%	0.11%	6.20%	12.17%	0.03%
Contracted Rate	2,300,000	0.06%	0.09%	0.05%	2.80%	5.49%	0.01%
Regional Average							
Maximum Mining	5,100,000	0.10%	0.17%	0.09%	5.59%	9.75%	0.02%
Contracted Rate	2,300,000	0.04%	0.08%	0.04%	2.52%	4.40%	0.01%
Craig Only							
Maximum Mining	5,100,000	0.07%	0.15%	0.11%	4.98%	7.33%	0.01%
Contracted Rate	2,300,000	0.03%	0.07%	0.05%	2.25%	3.31%	0.01%

Indirect Coal Combustion GHG and Climate Change Impacts

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 *a* 100 year *timespan,* 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 4.3-10**).

Table 4.3-10 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 CO_2e (Metric Tonnes)	Total CO_2e (Metric Tonnes)
81,650,000	Proposed Total Mine Tonnage	189,874,658	22,391	559,772	3,257	970,543	191,404,973
5,100,000	Proposed Maximum Annual Mine Tonnage	11,859,899	1,399	34,964	203	60,622	11,955,485

The values detailed in **Table 4.3-10** 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 20*31*. 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 0.041 percent of estimated global emissions and 0.196 percent of estimated U.S. net emissions at the maximum mine rate; these emissions would be negligible *and long term*. It should be noted *that based on historical sales data provided by Colowyo,* these rates exceed the *average* utilization rate of Colowyo coal at the Craig Generating Station and as such exceed the emissions historically generated *by more than twice the average amount*. 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). The model included an estimate of 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 (October 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. *OSMRE has elected not to specifically quantify the SCC. First, the GHG emissions associated with the Project are mostly from the indirect effects of coal combustion, and there is no consensus on the appropriate fraction of SCC tied to electricity generation that should be assigned to the coal producer. In addition, there is no certainty that GHG emissions at Craig Generating Station would actually be reduced if Colowyo coal from the Collom expansion was not mined given that Craig Station has alternative sources for coal. Finally,* 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. GHG coal combustion emissions are quantified and contextualized against global and national GHG emissions above.

Ozone Impacts

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

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

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 ozone generator or a net ozone inhibitor. When the VOC/NOx ratio in the ambient air is low, NOx tends to inhibit ozone formation. In such cases, the amount of VOCs tends to limit the amount of ozone formed, and the ozone formation is called "VOC-limited". When the VOC/NOx ratio is high, NOx tends to generate ozone. In such cases, the amount of NOx tends to limit the amount of ozone formed, and ozone formation is called "NOx -limited" (CARB 2015).

Precursors of ozone 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. Based on the combustion at the Craig Generating Station at either the Alternative A maximum coal mining rate (5.1 mtpy) as well as at the reasonably foreseeable contracted coal combustion rate (2.3 mtpy), conservative estimates of ozone precursors are included in **Table 4.3-11**.

Table 4.3-11 Predicted Ozone Precursor Emissions Rates Based on 2013 Craig Generating Station Factors and Blasting Emissions, Alternative A

Emissions Method	Coal Combustion Rate (tpy)	NO_2 (tpy)	VOC (tpy)
Craig Max Mining Rate	5,100,000	15,148.96	77.92
Craig Station Firing Rate	2,300,000	6,831.88	35.14
Blasting	N/A	3,820.24	0.81

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

Regional Ozone 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).[5] 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 4.3-12** outlines the regional ozone concentrations at three monitoring sites. The current ozone standard is 0.070 ppm.

Table 4.3-12 2014 Western Slope Ozone Monitor Concentrations

Site Name	Location	Ozone 8-hr Avg (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

Ozone standards are based on the 4th high value averaged over a three year period for the 8-hr averaging period. For all monitor locations operated by CDPHE, the ambient concentration values indicate that the region is in compliance with the ozone NAAQS suggesting that reasonably foreseeable rates of coal combustion emissions for Alternative A would not produce exceedances of the NAAQS. This includes compliance with the 2015 revised ozone NAAQS.

There have been ozone exceedances (at non-CHPHE sites) of the new 0.070 ppm standard regionally. These exceedances have occurred in Rio Blanco County at the Rangely site (operated by BLM). CDPHE believes these exceedances are related to other regional source categories, such as oil and gas, not to the Craig or Hayden generating stations. The combustion rates of the Craig and Hayden Generating Stations *have remained relatively constant over the*

[5] See Figure 1 of the Colorado Annual Monitoring Network Plan 2015: Colorado Air Pollution Control Division: http://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=2015AnnualNetworkPlan.pdf

recent past and are not proposed to change in the foreseeable future. *The exceedance values recorded at the Rangely monitoring site have been correlated with the increased oil and gas development activity in the Uintah Basin in Utah. Utah has implemented emission controls and more recent monitoring has shown a decrease in ambient concentrations at the Rangely site.*

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 4.3-13** presents the actual mercury emissions that were reported by the facility.

Table 4.3-13 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 *vary significantly between 2007 and 2013 due to actual mercury stack test data being collected in comparison to the use of TRI estimated emission calculations for 2007 and 2008.*

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 4.3-14**.

Table 4.3-14 Potential Coal Combustion Mercury Emissions Using Craig Generating Station TRI Actual Emissions, Alt. A

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)
81.7 MT (Project Total)	2.58292E-05 (lbs/ton combusted)	9.20858E-06 (lbs/ton combusted)	2,108.95 (lbs Hg)	751.88 (lbs Hg)
5.1 mtpy (Maximum Annual Production)	2.58292E-05 (lbs/ton combusted)	9.20858E-06 (lbs/ton combusted)	131.73 (lbs Hg/year)	46.96 (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 4.4 percent of the state mercury emissions if 5.1 mt of Colowyo Coal Mine 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 46.96 lbs/yr described above from the 2013 TRI is 6.3 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 0.092 percent.

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 2 $\mu g/m^2$ from 7.8 $\mu g/m^2$ in 2008 to 9.8 $\mu g/m^2$ in 2013 even in the face of declining regional mercury emissions. The cause of the increased deposition is not fully understood but long range mercury transport from national or international sources is one possible cause.

Based on a review of the percentage of mercury being generated by the combustion of Colowyo coal and the review of regional and national monitoring data, the effect to indirect coal combustion mercury impacts is predicted to be insignificant.

4.3.2.6 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 FRM monitors rather than FEM. The EPA has defined FRMs for the measurement of various criteria pollutants, such as carbon CO, O_3, SO_2, NO_2, PM_{10}, and $PM_{2.5}$. These methods are described in detail in 40 CFR 50. 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 can be FRMs. The EPA also allows the use of equivalent methods (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. .

Both the North monitor and Gossard monitor are FEM monitors and are considered to represent localized conditions at the mine, but are not operated as FEM monitors due to the fact that they do not meet all EPA-defined DQOs. *The implementation of the DQOs introduces a significant time and analysis burden and as such is only introduced for monitors that will be used for NAAQS compliance.* 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 ozone data is shown and discussed in a regional NAAQS compliance context.

2013 Compliance

The Western Slope monitors remained unchanged from 2012 and results were similar to the previous year (**Table 4.3-15**).

Table 4.3-15 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 4.3-16**).

Table 4.3-16 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 *adjacent to* 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 localized sources or natural phenomena outside the control of Colowyo or other facilities.

As discussed in **Section 4.3.2.4** under "Regional Ozone Compliance", there are no CDPHE reported ozone exceedances regionally of the current 0.070 ppm standard. The combustion rates of the Craig and Hayden Generating Stations are not proposed to change in the foreseeable future. Although the precursor emissions are high it does not equate to a regional ozone compliance issue. The regional ozone reaction is limited by VOC emissions; even large amounts of NOx emissions do not lead to higher ozone concentrations. Although the emissions rates for NO_x are substantial from the coal combustion, if the regional ozone reaction is limited by VOC emissions, even large amounts of NO_x emissions do not lead to higher ozone concentrations.

There have been ozone exceedances of the new 0.070 ppm standard regionally. These exceedances have occurred in Rio Blanco County at the Rangely site (operated by BLM). CDPHE believes these exceedances are related to other regional source categories, such as oil and gas, not to the Craig and Hayden generating stations. The combustion rates of the Craig and Hayden Generating Stations are not proposed to change in the foreseeable future. Although their precursor emissions are high it does not equate to the creation of a regional ozone compliance issue. The regional ozone reaction is limited by VOC emissions; without large VOC emissions, even large amounts of NOx emissions do not lead to higher ozone concentrations. Although the emission rates for NOx from the coal combustion are substantial, if the regional ozone reaction is limited by VOC emissions, even large amounts of NOx emissions from the power plants do not lead to higher ozone concentrations.

4.3.2.7 Indirect Railroad Emission Estimates

Coal Transporting

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 5.1 mtpy. The mass of coal per railcar is 100 tons, and a coal train is normally comprised of approximately 110 railcars. That equates to 11,000 tons of coal per rail shipment. The estimated maximum number of annual shipments is 464. 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 4.3-17.**

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 325. Emissions are determined by the annual power usage of 5.2 million bhp-hours. **Table 4.3-17** 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 4.3-17** outlines the emissions that would be associated with a four week maintenance project under Alternative A.

Table 4.3-17 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	5.7	7.3	0.2	0.03	0.02	2,792	0.07
Railroad Maintenance	0.1	0.1	0.5	0.5	0.1	0.1	1.5E-02	605	0
Total	0.2	0.2	6.2	7.8	0.3	0.1	0.04	3,397	0.07

[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 0.2 and 0.27 tpy, 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 0.0141 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 *are predicted to* be insignificant when compared to total HAPs emitted in the surrounding counties.

4.3.3 Alternative B (Reduced Mining)

Alternative B is similar to Alternative A with the exception of the Little Collom X Pit not being mined to eliminate potential GRSG concerns. Ambient air quality analysis conducted for 2014 through 2021 with an assumed maximum annual coal throughput of 5.*0* mtpy beginning in 2021. South Taylor operations continue through 2019, but are reduced each year from beginning in 2014. Eleven actual operational scenarios were simulated to demonstrate all foreseeable realistic equipment combinations from 2014-2018. Operating scenarios are reduced in 2019 to ten; three in 2020 and only one in 2021.

4.3.3.1 Direct Mining Criteria Pollutant Impacts

Emission Estimates

Emission potentials are evaluated for all years from 2014 through 2021. All subsequent years are assumed to be identical to 2021. It was determined that maximum emissions are established in 2019. Therefore, all emissions described in the following sections are based off of 2019 operating scenarios.

All emission sources within Alternative B are similar to those described in **Section 4.3.2.1**. This includes fugitive, process, and tailpipe emission categories. Little Collom X Pit removal from emissions (2.6 mt) is the primary difference between Alternative A and B.

4.3.3.2 Alternative B Direct Emission Calculations

Utilizing the assumptions and processes described above, emissions were calculated for criteria pollutants and HAPs (**Table 4.3-18**).

Table 4.3-18 Criteria Pollutant & HAP Emission Estimates (tpy), Alternative B

Source[1]	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2	HAPs
Fugitive	2,770	275.5	2,811	17,768	0.6	1.6	4.2E-03
Process	6.0	0.9	0	0	0	0	0
Tailpipe	3.2	2.8	577	311	63.5	0.4	8.0
Total	2,779	279	3,388	18,079	64.1	2.0	8.0

[1] *Values differ from Alternative A mainly due to difference in required haul road distance.*

When comparing gaseous criteria pollutants to state and national totals from the 2011 NEI, Alternative B would have a negligible *long-term* impact. On a percentage basis, Alternative B would range from 0.004 percent to 1.3 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 0.00003 percent to 0.02 percent. SO_2, again, would contribute the least, and CO would have the highest percentage. 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 0.03 percent to 31.6 percent. All comparisons are either less than 1.0 percent, demonstrate modeling compliance (**Section 4.3.3.3),** or regional monitoring data does not show a NAAQS violation. Therefore, emissions are *predicted to be* insignificant.

Particulate emissions would be similar. With fugitive emissions included, Alternative B would contribute 0.30 percent of the statewide $PM_{2.5}$ emissions. PM_{10} emissions associated with Alternative B would be 0.84 percent of the statewide total with fugitive emissions included. National percentages would be even less at 0.005 percent and 0.013 percent. Direct particulate emissions associated with Alternative *B are predicted to* be insignificant in comparison to Colorado and nationally. The surrounding county comparison showed that Alternative B would be a maximum of 12.4 percent of the region's particulate emissions. All comparisons are either less than 1.0 percent, demonstrate modeling compliance (**Section 4.3.3.3**), or regional monitoring data does not show a NAAQS violation. Therefore, emissions are *predicted to be* insignificant.

The county maximum HAPs comparison of Alternative B would be 9.3 percent of the EPA 2011 NEI. The maximum HAPs emissions contributed by Alternative B would be 0.004 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 2011 and Alternative B would contribute 0.00009 percent. The amount attributed to Alternative B *is predicted to be* insignificant by comparison.

While there would be a moderate to high contribution of emissions from Alternative B to the region, Moffat County has consistently maintained its designation of attainment with current monitoring well under NAAQS levels (**Section 4.3.2.4**).

Onsite (North and Gossard) Particulate Monitoring Data

The onsite monitoring data presented under Alternative A (**Section 4.3.2.2**) is appropriate for describing the ambient conditions under Alternative B. Additionally, because fugitive dust controls under both alternatives remain the same, the impacts for Alternative A and B will be consistent.

Direct Greenhouse Gas Annual Emissions

Emissions for GHGs were calculated for the mine activities proposed to occur in 2019 as that year is expected to produce the greatest impact (**Table 4.3-19**). These emissions are based on the worst case emissions operating scenario for 2019. The emissions calculations utilized activity rates that were provided by Colowyo for the mining that would occur during that year.

Table 4.3-19 Maximum Emission Estimates (metric tonnes/yr)

Emission Unit	CO_2	CH_4	N_2O	GHG[1]
Scrapers	4,592	0.26	0.12	4,634
Drilling	22,374	0.90	0.18	22,449
Dozers	15,466	0.87	0.39	15,606
Graders	42,455	2.38	1.08	42,837
Haul Trucks (240T OB/Coal)	19,570	4.90E-03	4.61E-03	19,572
STA Haul Trucks (50T)	3,422	3.57E-03	3.36E-03	3,423
Collom Haul Trucks (50T)	7,656	7.98E-03	7.51E-03	7,659
Water trucks	13,052	1.31E-02	1.23E-02	13,056
Blasting	136,171	4.81	1.20	136,650
Access Road	62	3.58E-03	7.30E-03	64
Rail Maintenance	602	0.04	0.01	605
Methane Release	--	2,728	--	70,675
Total	**265,423**	**2,737**	**3.0**	**337,231**

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]	$PM_{2.5}$	PM_{10}
50 Ton	0.038	0.044
240 Ton[2,3]	0.029	0.031
Access Road[4]	5.39E-04	5.82E-04

1 Based on the length of the road, a percentage of the total VMTs are allocated to the paved road and in-pit road, respectively; speed is 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.

4.3.3.3 Dispersion Modeling Impact Analysis

The 2014-2021 calendar years were modeled to ensure NAAQS compliance for all years of active mining and reclamation activities within the Project Area. The South Taylor, West pit, East pit, and Collom Lite pits mining and/or reclamation activities were included as part of this analysis. Eleven scenarios of equipment allocation were analyzed and modeled, each as hypothetical real-life situations that could occur on any given day (2014-2018). Ten scenarios were analyzed for 2019; three for 2020, and one for 2021. 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 *5.0* 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 the North onsite meteorological station located at the following NAD 83 coordinates: 40° 16' 22.8" N, 107° 48' 36" W, elevation 7395 feet. These North Station data were used as an input following validation by CDPHE modeling personnel. Gossard Station meteorological data were not used, as the North Station is believed to be more representative of overall site conditions. The North Station is on a ridge-top, while Gossard is in a more sheltered location near the coal load-out. North Station data beginning in July 2008 to June 2011 and July 2012 to June 2013 were accepted by CDPHE and used in the analysis. 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. A wind rose of the data collected from July 1, 2008 through June 31, 2013 is presented as **Figure 4-2**.

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

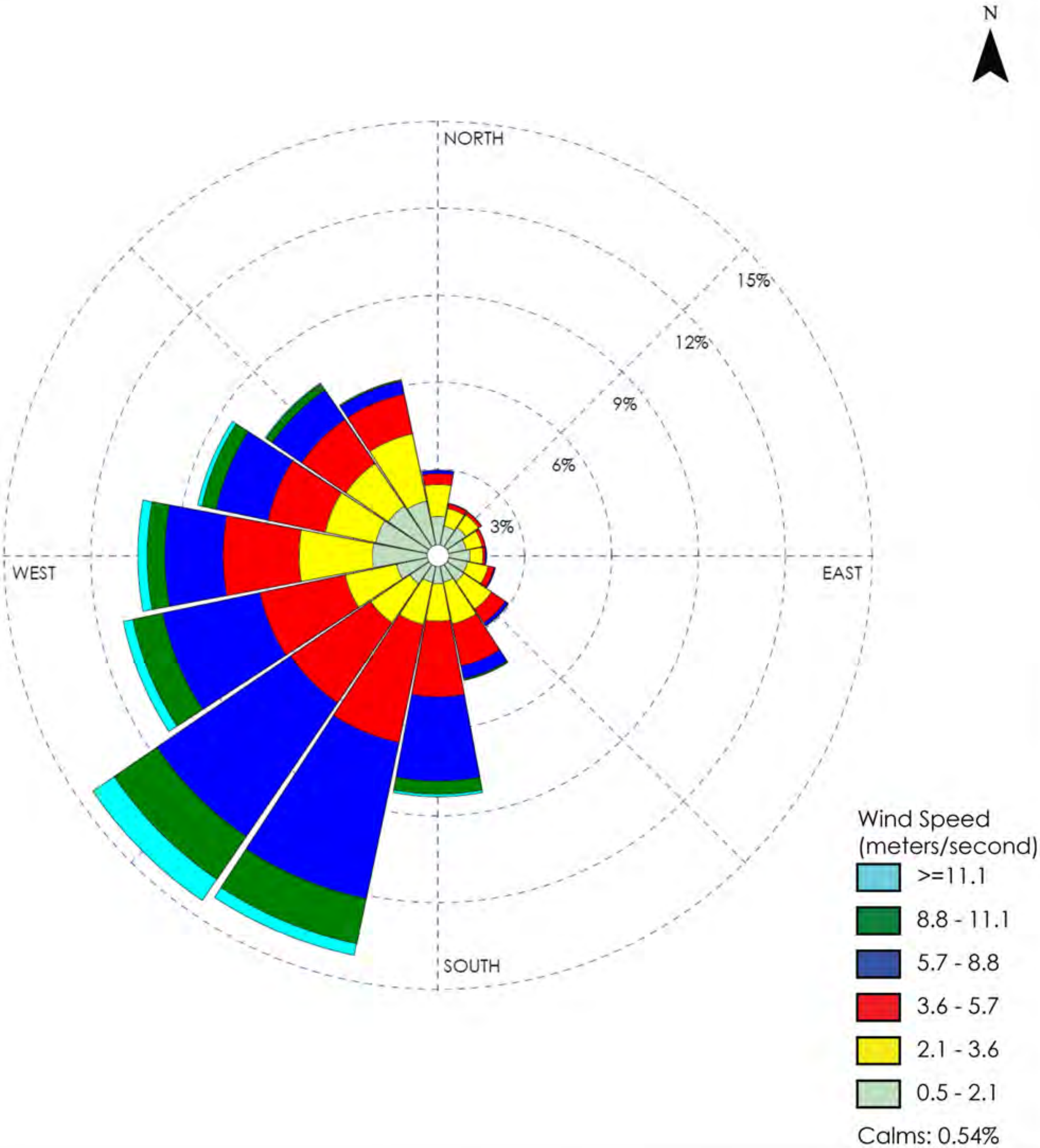
Dispersion modeling was conducted to estimate the potential future air quality impacts from the following criteria air pollutants for the indicated regulatory time periods. All modeled concentrations are applicable at any point of public access.

- 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. Note that the EPA is currently proposing an update to the guidance outlined in Appendix W. These include enhancements to the scientific formulation of AERMOD to address technical concerns expressed by the stakeholder community and improve model performance. These improvements are not expected to significantly change the results presented in this section. The pollutants were modeled without background concentrations. The modeled concentrations for each pollutant were added to background concentrations for comparison to the NAAQS.

Source Types

The Colowyo Coal 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 4-3** provides a general geographic representation of all modeled sources within the Project Area and relative distance to the outermost level of receptors. 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.



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

Total Count:
34763 hours

Date:
2/2/2015

Calm Winds:
0.54%

Average Wind Speed:
4.54 meters/second

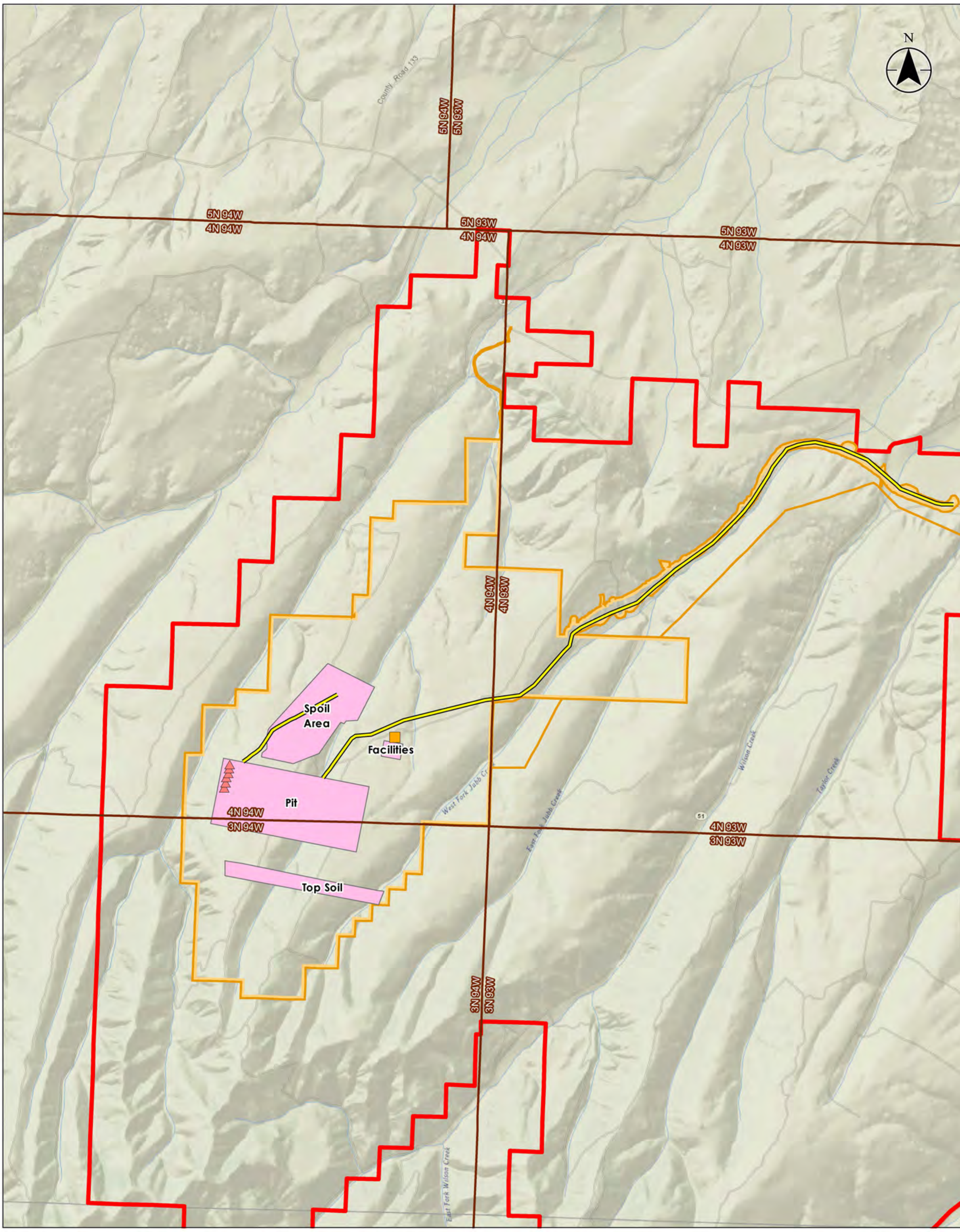
Disclaimer: Figure prepared for OSMRE by Stantec. Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

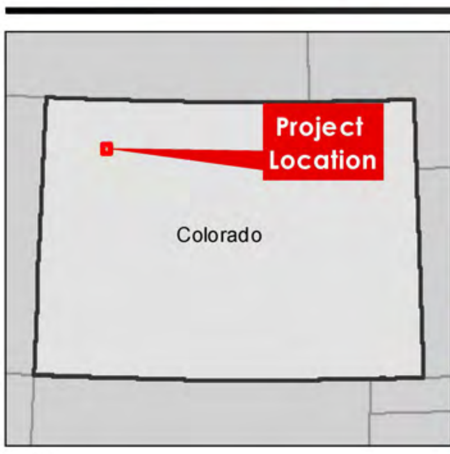
Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.
4-2

Title
Modeled Period Windrose





Blasting

Crusher

Haul Road

Polygon Sources

Project Area

Approved SMCRA Permit Boundary

Township Boundary

0 3,200 6,400
Feet
1:50,000 (At Original document size of 11x17)

Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.
4-3

Title
Geographic Location of Modeled Sources

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.

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 (APCD 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 4.3-21**).

Table 4.3-21 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

Modeled Operating Scenarios

South Taylor coal extraction is maximized during 2014 operations at 4 mtpy, while Collom coal extraction is maximized in 2021 operations at *5.0* mtpy. South Taylor mining operations are expected to continue through 2019. All subsequent years (2015-2019) are expected to have less than 4 mtpy of coal extracted. Collom haul road development is modeled during the 2015 model year. The 2016 model year includes the addition of the facilities construction. Note that because the facilities construction produces a greater amount of emissions than the ditch pond development and those two would not be constructed simultaneously, the pond is excluded from the modeling analysis. In order to account for operational uncertainty, multiple operational scenarios were modeled. 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. Sixty-nine 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 4.3-22** illustrates that all potential operational scenarios would be compliant with all NAAQS when implementing the maximum foreseeable mining rate of 4 mtpy and *5.0* mtpy for the South Taylor and Collom Project pits, respectively. The 1-hour NO_2 is the closest standard to being exceeded at 97.1 percent. The $PM_{2.5}$ and PM_{10} standards are also close to being exceeded at 94.6 and 95.8 percent, respectively.

Table 4.3-22 Minimum and Maximum Impacts 2014-2021 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	9	19	23-33	35	64.9-94.6%
	Annual	3	2	7	5-10	12	40.3-80.7%
PM_{10}[2]	24-hr	23	48	121	71-144	150	47.3-95.8%
SO_2[3]	1-hr	3	0.77	3.27	4-6	196	1.93-3.20%
NO_2[1,5]	1-hr	20	123	163	143-183	188	75.9-97.1%
	Annual	2	5.6	10.4	7.6-12.3	100	7.6-12.4%
CO[4]	1-hr	1,145	9,235	18,361	10,380-19,506	40,000	26.0-48.8%
	8-hr	1,145	1,304	4,390	2,449-5,535	10,000	24.5-55.4%

[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

4.3.3.4 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 for 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 4.3-23**.

Table 4.3-23 Predicted Criteria Emissions Data Based on Regional Maximum, Average, and Craig Generating Station Only Emissions Rates, 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							
Maximum Mining	5,000,000	*422.99*	*192.63*	*1514.30*	*18497.14*	*6649.28*	*140.36*
Contract Rate	2,300,000	*194.57*	*88.61*	*696.58*	*8508.69*	*3058.67*	*64.57*
Regional Average							
Maximum Mining	5,000,000	*317.26*	*170.67*	*1306.48*	*16674.53*	*5327.46*	*108.38*
Contract Rate	2,300,000	145.94	78.51	600.98	7,670.28	2,450.63	49.85
Craig Only							
Maximum Mining	*5,000,000*	*211.54*	*148.72*	*1514.30*	*14851.92*	*4005.63*	*76.39*
Contract Rate	2,300,000	97.31	68.41	696.58	6,831.88	1,842.59	35.14

The Hayden Generating Station emission rates were higher on a lb/MMBTU basis and produce the highest PM10, PM2.5, SO2, VOC, and NOx emission rates of the two facilities. The Craig Generating Station produced the higher emission rate for CO.

Emissions at the maximum Alternative B annual mining rate would range from 0.*01* percent to *7.19* 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.*56* percent of the total Colorado NEI emissions based on regional average emissions factor calculations (**Table 4.3-24**). 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 *and the annual rate of combustion at the Craig Generating Station of approximately 4.8 mtpy*.

As compared to the national NEI emissions totals, the maximum mining rates emissions represent between 0.00024 percent and 0.*119* percent based on the worst case regional emissions factors and between 0.00013 percent and 0.*0956* percent based on the Craig Generating Station emissions factors.

Emissions at the *5.0* mtpy mining rate when compared to the four surrounding counties would range from 0.*10* percent to *98.6* percent. *This large range is due to the percentage influence of the combustion emissions on different pollutants. For NO_2 and CO, the generating stations are a significant contributor to regional emissions totals. For other pollutants, like PM_{10}, the influence of the generating stations is predicted to be insignificant. Although the generating facilities produce a* significant contribution *to regional emissions for some pollutants,* the regional designation regarding NAAQS compliance would not change and would remain in attainment *under Alternative B*. As described in **Section 4.3.2.4**, the state monitoring network has shown compliance with the NAAQS when natural exceptional events are excluded.

Based on the maximum mining rate emissions impacts, Alternative B would be the same as Alternative A, however, the total coal recovery rate would be approximately 3 percent lower than those for Alternative A due to a longer duration of mining under Alternative A. All comparisons are either less than 1.0 percent, demonstrate modeling compliance (**Section 4.3.3.3**), or regional monitoring data does not show a NAAQS violation. Therefore, emissions *are predicted* to produce an insignificant impact.

Table 4.3-24 Predicted % Criteria Emissions Data Based on Regional Maximum, Average, and Craig Generating Station Only Emissions Rates, Alternative B

Emissions Method	Coal Combustion Rate (tpy)	PM_{10} (% of Colorado State 2011 NEI)	$PM_{2.5}$ (% of Colorado State 2011 NEI)	CO (% of 2011 Colorado State NEI)	NO_2 (% of Colorado State 2011 NEI)	SO_2 (% of Colorado State 2011 NEI)	VOC (% of Colorado State 2011 NEI)
Regional Maximum							
Maximum Mining	*5,000,000*	*0.13%*	*0.19%*	*0.11%*	*6.08%*	*11.93%*	*0.03%*
Contract Rate	2,300,000	0.06%	0.09%	0.05%	2.80%	5.49%	0.01%
Regional Average							
Maximum Mining	*5,000,000*	*0.10%*	*0.17%*	*0.09%*	*5.48%*	*9.56%*	*0.02%*
Contract Rate	2,300,000	0.04%	0.08%	0.04%	2.52%	4.40%	0.01%
Craig Only							
Maximum Mining	*5,000,000*	*0.06%*	*0.15%*	*0.11%*	*4.88%*	*7.19%*	*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 4.3-25**).

Table 4.3-25 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)
79,100,000	Proposed Total Mine Tonnage	183,944,709	21,692	542,290	3,155	940,232	185,427,230
5,*000,000*	Proposed Mine Rate Maximum	*11,627,352*	*1,371*	*34,279*	*199*	*59,433*	*11,721,064*

The values detailed in the table represent emissions calculated for the combustion of all coal at the proposed annual maximum mining rate and total GHG emissions from the combustion of all coal to be mined under Alternative B. The future GHG emissions (potential impact) under Alternative B would account for 0.*040* percent of estimated annual global emissions and 0.19*3* percent of estimated annual U.S. net emissions. This represents a *long-term* negligible potential impact under Alternative B.

Social Cost of Carbon

Due to the reduction in total coal mined from Alternative A (81.7 mt) to Alternative B (79.1mt) total Project CO_2e emissions would be reduced from 191,404,973 to 185,427,230 metric tons. As previously noted, *OSMRE has elected not to specifically quantify the SCC. First, the GHG emissions associated with the project are mostly from the indirect effects of coal combustion and there is no consensus on the appropriate fraction of SCC tied to electricity generation that should be assigned to the coal producer. In addition, there is no certainty that GHG emissions at Craig Generating Station would actually be reduced if Colowyo coal from the Collom expansion was not mined given that Craig Generating Station has alternative sources for coal.*

Additionally, NEPA does not require *that* a cost-benefit analysis *be prepared and considered*. Presenting the SCC cost estimates quantitatively, without a complete monetary cost-benefit analysis that includes the social benefits of energy production, would be misleading. *The SCC calculation was developed by EPA for programmatic applications such as broadly applicable rulemaking activities. The use of the SCC calculation for a project specific activity such as the EA for this Project is inappropriate.* For *these* reasons 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 ozone precursors are included in **Table 4.3-26**. The emissions were calculated in a fashion consistent with the method described for Alternative A.

Table 4.3-26 Predicted Ozone Precursor Emissions Rates Based on 2013 Craig Generating Station Factors and Blasting Emissions, Alternative B

Emissions Method	Coal Combustion Rate (tpy)	NO_2 (tpy)	VOC (tpy)
Craig Max Mining Rate[1]	*5,000,000*	*14851.92*	*76.39*
Craig Station Firing Rate[1]	2,300,000	6,831.88	35.14
Blasting	N/A	2,811.12	0.60

[1] These emissions are based on emissions stack output using the APENS data and represent all emissions controls. They do not account for future control planned for the facility.

Although these values represent large amounts of ozone precursors, emissions from the Craig Generating Station, as well as all other regional sources of precursor emissions, have not produced significant ozone impacts as indicated by regional ozone monitoring and Moffat County's current attainment with the ozone NAAQS. A detailed description of the monitoring data for all criteria pollutants from 2007 through present is described in the following sections. The ozone component of these descriptions demonstrates that ozone impacts would not exceed the NAAQS and would therefore not be considered significant. *Additionally, the emissions in the table do not account for future emissions controls that are currently planned for the Craig Generating Station.*

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 4.3-27**).

Table 4.3-27 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. *Additionally, as noted in*

***Section 4.3-13**, the TRI reported emission after 2008 were based on stack test data.* The resultant mercury emissions impacts are detailed in **Table 4.3-28**.

Table 4.3-28 Potential Coal Combustion Mercury Emissions Using Craig Generating Station TRI Actual Emissions, Alt. B

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)
79.1 MT (Project Total)	2.58292E-05 (lb/ton combusted)	9.20858E-06 (lbs/ton combusted)	2,043.09 (lbs Hg)	728.40 (lbs Hg)
5.*0* mtpy (Maximum Annual Production)	2.58292E-05 (lbs/ton combusted)	9.20858E-06 (lbs/ton combusted)	*129.15*.73 (lbs Hg/year)	*46.0* (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 4.3-29**).

Table 4.3-29 Approximate Mercury Emissions from the Craig Generating Station Based on TRI Actual Emissions, Alternative B

Reporting Year	Hg Emissions (lbs/yr)
2007 TRI	1.0
2008 TRI	30.5
2009 TRI	8.4
2010 TRI	12.3
2011 2011 TRI	17.1
2012 TRI	11.8
2013 TRI	15.5
Total	96.8

As can be seen by comparing **Table 4.3-27** and **Table 4.3-29**, 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 79.1 million tons of coal mined under Alternative B would result in 728.40 lbs of mercury. This value is approximately 3.2 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 *4.3* percent of that total for 2013 based on the total mercury generated in Colorado under the Alternative B maximum mining rate (5.*0* 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.*10* percent. This represents a negligible to minor percentage of the total mercury generated both in Colorado and nationally.

4.3.3.5 Regional NAAQS Compliance

The regional NAAQS compliance presented under Alternative A (**Section 4.3.2.6**) is appropriate for describing the ambient regional conditions under Alternative B. Additionally, Alternative B presents dispersion modeling data to verify ongoing NAAQS compliance when the direct project emissions are introduced **(Section 4.3.2.2).**

4.3.3.6 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. It is expected that the maximum annual amount of coal shipped would be 5.*0* million tons. **Table 4.3-30** outlines the maximum criteria pollutant emissions, GHG emissions, and HAP estimated emissions that result from rail transport and maintenance from the Colowyo Coal Mine.

Table 4.3-30 Railroad Coal Transport and Maintenance Emission Estimates (tpy)

Source	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2	HAPs	GHG[1]	Black Carbon[2]
Coal Transport	0.1	0.1	56	7.2	0.2	0.03	0.02	2,737	0.07
Maintenance	0.1	0.1	0.5	0.5	0.1	0.1	1.5E-02	605	0
Total	0.2	0.2	*6.1*	7	0.3	0.1	0.04	*3,342*	0.07

[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 0.2 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 0.01 to 3.30 tons/yr. The range of emissions for the upper bound (5.*0* mtpy) is 0.03 - 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.*014* percent of all criteria pollutants and 0.0*4* 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 2011 (based on the EPA NEI); therefore, the percentage associated with the railcars would be 0.00001 percent.

4.3.4 Alternative C (No Action)

4.3.4.1 Direct Emissions Impacts

Alternative C assumes that mining would not occur for the Little Collom X or Collom Lite pits if the Project was not approved. All direct emissions would occur from active mining within the South Taylor pit and reclamation in the West and East pits. Emissions would be based on 4.0 mtpy with operation ceasing following 2019. Following 2019, an insignificant amount of criteria emissions associated with reclamation activities *is predicted to* continue to occur until reclamation is complete (OSMRE 2015).

4.3.4.2 Indirect Combustion Criteria Emissions Impacts

Under Alternative C, criteria pollutant emissions from coal combustion at the Craig Generating Station would remain consistent with the current emissions rates. The mine would continue to provide coal to the Craig Generating Station. As the coal from South Taylor begins to decline, 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 assumption is that the plant would identify other regional sources of coal in place of South Taylor and maintain its current permitted maximum generating rate.* As such, the emissions from the Craig Generating Station through 2019 would remain consistent with those reported to CDPHE for 2013 (reported in 2014), without considering future emission reductions to comply with federal and state regulations and plans (**Table 4.3-31**).

Table 4.3-31 Criteria Pollutant Emissions Rates

Location	2013 (reporting year) APENS Annual Actual Pollutant Emissions (tpy)					
	PM_{10}	$PM_{2.5}$	CO	NO_2	SO_2	VOC
Craig Generating Station	172.2	121.1	1,232.8	12,091.0	3261.0	62.2
Hayden Generating Station	148.3	67.5	385.1	6,483.6	2,330.7	49.2

4.3.4.3 Indirect Coal Combustion GHG and Climate Change Impacts

Under Alternative C, GHG emissions from the Craig Generating Station would remain consistent with the current emissions rates. The mine would continue to provide coal to the Craig Generating Station. As the coal from South Taylor begins to decline, 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 4.3-32**. The calculations assume that the maximum 2013 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 Coal Mine.

Table 4.3-32 GHG Coal Combustion Emissions, Alternative C

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 CO_2e (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 Coal Mine. Under Alternative C, 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 Coal Mine. These emissions account for approximately 0.037 percent of estimated global emissions and between 0.48 percent of estimated U.S. net emissions. A statewide comparison equates to 8.3 percent. These levels are less than those that would be generated under Alternatives A (9.6% of state) and B (9.5% of state).

4.3.4.4 Social Cost of Carbon

For Alternative C, 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 Alternative A.

4.3.4.5 Ozone Impacts

With Alternative C, precursors of ozone 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 Coal Mine.

Table 4.3-33 presents the ozone precursor emissions that were reported for the Craig Generating Station to CDPHE for the 2013 reporting year.

Table 4.3-33 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 ozone reaction is limited by VOC emissions, even large amounts of NOx emissions do not lead to higher ozone concentrations. There would be no emissions factor change (increase or decrease) in the production of ozone precursors from any of the alternatives.

4.3.4.6 Indirect Mercury Emissions

Under Alternative C, 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 Coal Mine to the future.

Mercury emissions for the Craig Generating Station were reported by the facility for all atmospheric emissions sources as presented in **Table 4.3-10**.

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 *and a transition to using stack test data for reporting*. Emissions at the Craig Generating Station under the No Action Alternative would continue at annual rates similar to those detailed in **Table 4.3-10**. 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 Alternative C, assuming that the same amount of coal is provided from another source than the Colowyo Coal Mine.

4.3.4.7 Rail Car Emissions Impacts

Under Alternative C, less coal would be transported from the mine. As a result, fewer emissions would be generated by rail travel or maintenance associated with coal transport from the mine. Following 2019, the emissions would cease.

4.3.5 Mitigation Measures

No mitigation measures would be necessary for air and climate resources.

4.4 GEOLOGY

4.4.1 Alternative A (Proposed Action)

Alternative A would result in the removal of the recoverable coal in the Little Collom X and Collom Lite Pits. Coal seams that would be mined via truck/shovel, dragline, and highwall miner techniques include the X3, X4, D1, D2, D12, FA, FB, G7, G8, G9, GA, and GB seams. Colowyo anticipates mining a maximum of approximately 5.1 mtpy with operations occurring 24 hours a day. Removal of the coal in the Project Area via surface mining techniques would result in the removal of the geological column as coal is mined out and the area is subsequently backfilled and reclaimed. This would occur to the overall depth of the proposed mining pits and would be a permanent impact. However, the Colowyo Coal 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 *long term but* negligible to minor to that area as a whole.

4.4.2 Alternative B (Reduced Mining)

Under Alternative B, impacts to geology would be similar to those under Alternative A. However, the Little Collom X Pit would not be mined under this alternative so the overall impacts to the geologic column would be less but still negligible to minor *and long term*. The same mining techniques would be used as under Alternative A and the same coal seams would be mined.

4.4.3 Alternative C (No Action)

Under Alternative C, no mining would occur within the Project Area. Therefore, there would be no impacts to the geological resources.

4.4.4 Mitigation Measures

No mitigation measures would be necessary for geology.

4.5 WATER RESOURCES

4.5.1 Alternative A (Proposed Action)

4.5.1.1 Surface Water

The Collom Lite Pit, the Little Collom X Pit, the temporary overburden stockpile, the Little Collom sump, and the sediment control pond would each physically disrupt the stream channel in Little Collom Gulch. Physical disruption to approximately 3.5 miles of the main channel would occur through excavation or fill placement, rendering the channel nonfunctional in those locations. No flows were reported in this ephemeral channel during the baseline monitoring period (**Section 3.6**). Although at times runoff may report to the Gulch, a diversion ditch would not be placed at the proposed upstream pit boundary where the contributing watershed area is less than one square mile. Farther downstream, where potential runoff peak flows increase and where there is physically more room to construct a stable diversion, a diversion capable of passing the 100-year storm flow would be placed alongside the haul road. Two small tributaries of Little Collom Gulch would be intercepted by the Little Collom X Pit; their runoff would be diverted around the pit in a ditch designed for the 100-year storm event. In addition, the west boundaries of both pits would encroach into the East Fork Collom Gulch and mainstem Collom Gulch drainage areas (i.e., catchments or watershed areas, but would not directly disturb either stream channel). Similarly, the east boundary of the Collom Lite Pit would encroach into West Fork Jubb Creek's drainage area. The area pad for the facilities would disrupt a tributary to Little Collom Gulch; its flows, as well as drainage from the entire pad, would be directed to a storage pond.

The potential effects of these alterations offset each other. Precipitation that falls within the confines of pits and ponds is not available to continue downstream as surface flows. Similarly, neither is up-gradient runoff that is directed to these areas. This generally has the effect of reducing peak flows associated with a given runoff event as well as reducing annual flow or watershed yield. Conversely, earth disturbances in general, and diversions in particular, tend to increase runoff and peak flows. This is due, in part, to vegetation removal, soil compaction, flow path alteration, and time-of-concentration increases; these effects have been well established by observation, literature, and research. Therefore, the net effect of the Project's pits and ponds on downstream flows or channel morphology would likely be negligible *but long term*, in large part due to the ephemeral nature of the streams at these locations as well as the headwater locations with small contributing watershed areas upstream of the Project disturbances. Flooding and stream flow regime do not appear to have been affected by past mining operations in similar settings at the existing Colowyo Coal Mine (Colowyo 2011).

Stream flows may also be marginally affected by a reduction in contribution of spring/seep flows. Five seeps or springs within the Little Collom Gulch drainage area (SPRLC-01, SPRLC-02, SPRLC-03, V11, and V29) would be eliminated by mining. Additionally, flows from V1, V10, and V32 (**Figure 3-1**), all within the West Fork of Jubb Creek, may be diminished due to the elimination of portions of their likely recharge areas. However, these surface expressions of groundwater contribute a very small portion of downstream flows (Colowyo 2011). Any disruption or diminution would affect the springs themselves and any ecological benefits that they may support. This would be a long-term, minor impact.

The retention of the large majority of runoff produced on mine-related disturbances serves to protect downstream water quality. In part, the storage pond that would be constructed within the facilities area would serve to retain any inadvertently spilled or leaked fluids (such as hydrocarbons) as well as any coal fines, dissolved salts, or sediments transported by runoff. Other BMPs in the facilities area (e.g., lined structures, *secondary containments,* spill training, berms) would reduce the potential for such incidents to occur in the first place. Additionally, runoff from the primary crusher facility would be directed into the Collom Lite Pit. Runoff produced on haul roads would also be directed to one of the mining pits to the extent possible or to the sediment control pond. These and other measures such as creating small depressions, dozer basins, and sediment traps would serve to minimize runoff that could potentially carry coal fines or non-coal sediments entering downstream waters. Some measures, such as silt fences and straw bales, may be used on a temporary basis during construction; others such as ditches and culverts may be used throughout operations, and would be designed for precipitation events of higher frequency than the larger sump and sediment pond structures. Ongoing inspections and maintenance would ensure their functionality. Overall, the combination of structural and non-structural BMPs would reduce potential surface water quality impacts due to spills and erosion to negligible levels.

The sump and the sediment control pond would be incorporated into Colowyo's existing NPDES permit as additional outfalls. This permit allows release of collected water from outfalls for events greater than the structure's design capacity and sets effluent limitations for such discharges. As such, this would provide additional regulatory oversight to further ensure that impacts to downstream water quality do not occur. For example, the Colowyo Coal Mine would have to comply with all effluent limits in their CDPS permit for all discharges from the disturbed areas and these limits would most certainly include iron limits as well as 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 Generating Station would also be required to comply with their CDPS effluent limits for any discharges, and these limits currently include iron.

As part of the Colorado Discharge Permit System (CDPS) permitting process for any new outfalls, CDPHE would determine through a Reasonable Potential analysis whether or not there is a reasonable potential for any of the constituents (iron, mercury, and selenium) discussed in **Section 3.6** to become elevated in the Colowyo Coal Mine's discharge water and potentially creating adverse effects on downstream waters and aquatic life. If so, effluent limits would be imposed in the permit to ensure that aquatic life and downstream water quality would be protected for its designated beneficial uses. This reasonable potential analysis is typically done as a matter of course for all CDPS permit renewals, and for permit modifications where relevant. CDPHE's CDPS Regulations (CDPHE *2012b*) includes this requirement, as discussed in part at Section 61.8(2)(b)(i). The goal is to ensure that effluent limitations included in a given permit will provide sufficient controls such that water quality standards will be met. The reasonable potential analysis can be done using water quality modeling, existing effluent data, toxicity testing, etc. to make the determination. When the analysis shows "…*that a discharge causes, has the reasonable potential to cause, or measurably contributes to an in-stream excursion above the allowable ambient concentration of a numeric water quality standard for an individual pollutant, the permit must contain effluent limits for that pollutant*" (Section 61.8(2)(b)(i)(C)).

Based upon the existing mining operations and these CDPS permitting requirements, it is likely that iron, mercury, or selenium limitations would be established at the Collom Coal Mine. The Craig Generating Station would also be required to comply with their CDPS effluent limits for any discharges, and these limits currently include iron. Additionally, 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.

Runoff and sediment control measures would be implemented prior to other ground disturbances, providing water quality protection from the initial construction stages of the Project. While some would be removed over time, others would be left in place as needed until reclamation, including revegetation, is completed and successful. 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 topsoiled, benched as needed, and revegetated. Once reclaimed, historic drainage patterns would be re-established.

Another mechanism that could potentially impact surface water quality is changes in groundwater quality with subsequent reemergence in downstream channels. However, the PAP (Colowyo 2011) also described the potential for a marginal impact to water quality in the Collom Gulch, Little Collom Gulch, and Jubb Creek drainages. As evaporation of water collected within the pit occurs and further dissolves pit floor and wall surfaces, TDS may negligibly increase. This in turn could increase loading of dissolved solids to shallow groundwater down-gradient of the pit, which in turn may eventually enter the surface water system. This would not be likely to occur in any measurable degree, because accumulated pit water would be collected and used for dust control, etc.

Overall, the impact to surface water quantity and quality under Alternative A would be *long term and* negligible or minor.

4.5.1.2 Groundwater

The potential loss of springs and/or spring flow was described above under surface water. Additionally, within the Collom Lite Pit area, groundwater is expected to be present in limited perched zones in the upper coal seams and sandstone units. As mining progresses through these zones, perched water may seep out and into the pit. Within the existing Colowyo Coal Mine pits, these seeps primarily occur within the uppermost coal seams and normally drain within a few weeks as these very small aquifers are depleted. Sustained seeps recharged by upgradient drainages also occur within the existing Colowyo Coal Mine pits, with a total discharge of approximately 15 to 25 gpm. Both of these types of groundwater discharge may require removal from the Collom Lite Pit by pumping so as not to interfere with mining. Perched groundwater is less likely to be encountered while mining the Little Collom X Pit, in part due to its dip toward Little Collom Gulch. If encountered, it would be expected to be of very limited quantity and areal extent, but also may require pumping.

In addition, saturated conditions are expected to be present below about 7,150 feet elevation, which would affect the lower third of the sequence to be mined. If this saturated zone is not dewatered, the northern (down dip) portion of the Collom Lite Pit would likely accumulate groundwater, hindering mining. Colowyo proposes to dewater ahead of mining by installing several wells designed to locally drop the groundwater level in the vicinity of the pit in a timely manner. The wells would be placed within approximately 500 feet of the projected pit outline and would be completed between 50 and 100 feet below the pit floor. Once the first cuts are mined, dewatering would not likely be needed for the remainder of the mining, due to the higher pit floor. However, dewatering would likely continue for at least the first seven years of mining. Pumping beyond that time would depend on the degree of desaturation and depressurization accomplished at that point in time. The floor of the Little Collom X Pit would be well above the saturated water zone, thus no dewatering wells would be necessary at this location.

There would be no potential for pit dewatering to impact the nearest non-Colowyo domestic or commercial wells, as they are located more than two miles away and are topographically, stratigraphically, and structurally lower than the Collom Lite Pit location (Colowyo 2011). Further, there would be no potential for impacts to other areas of the regional aquifer associated with the Trout Creek Sandstone. It would not be intercepted by the dewatering wells or the pits, and is separated from these mining features by various low permeability beds, including the aquiclude associated with the KM bed located about 200 feet beneath the planned pit bottom. Additionally, any operational use of this water (or other water from another source) would only occur under an appropriate water right, for which the Colorado State Engineer would have assessed as not impacting other users.

Once dewatering stops, the piezometric surface would be reestablished. Ground water from the pit walls below an elevation of 7,150 feet would come into contact with the backfill much faster than any other ground (or surface) water source. This level would be established before mining ceases in Collom, so all possible pit backfill recharge would occur above (on top of) this level. Seepage would occur through the pit walls in a northerly direction due to the hydraulic gradient in the area. This flow would be predominantly through the coal, and to a lesser extent via sandstones and fracture planes. The groundwater would not be expected to discharge either to the valley *colluvium* or to the surface in Little Collom Gulch (Colowyo 2011).

If a backfill aquifer develops, which is possible but unlikely (Colowyo 2011), and establishes hydrologic connectivity between the valley *colluvium* and the backfill recharge, down-gradient spring flow would be possible. Under these conditions, backfill aquifer discharge of up to 0.45 cfs from the Collom Lite Pit into the Little Collom Gulch valley fill is possible. This water would then flow down Little Collom Gulch to Collom Gulch. The soonest that the flow would reach Collom Gulch in Section 13, T4N, R94W would be 150 years from the time pit dewatering stops (Colowyo 2011).

Major changes to water quality are not expected from any movement of saturated groundwater that has contacted overburden while moving through the backfilled pit walls. No significant acid-forming materials exist within the overburden soil or coal seams to be mined and no special overburden handling procedures would be needed. This water would be in contact with overburden that is not geologically or chemically different from the surrounding in situ material. However, some potential for a localized increase in TDS exists. Meteoric water would contact an increased surface area of soil in the vadose zone and thereby theoretically increasing the mass of dissolved solids entering shallow groundwater. These dissolved solids in shallow groundwater may eventually enter the surface water system, with a theoretical increase in dissolved solids in the surface water. This increase is calculated to be small enough to have no impact on the current or projected surface water uses in the Collom Gulch, Little Collom Gulch, and Jubb Creek drainages (Colowyo 2011). Thus, the impact would be *long term but* negligible.

A portion of the 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 CDPHE. 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 *long term but* negligible.

Overall, impacts to groundwater quantity and quality under Alternative A would be *long term but* negligible to minor.

4.5.2 Alternative B (Reduced Mining)

4.5.2.1 Surface Water

As with Alternative A, physical disruption to the main channel of Little Collom Gulch would occur through excavation or fill placement, rendering the channel nonfunctional in those locations. However, the reduction would be approximately 2.25 miles of linear channel distance, compared to 3.5 miles under Alternative A. Alternative B would also have less of a disruption to small tributary channels to Little Collom Gulch, because Little Collom X Pit would not be constructed (though fills would encroach upon portions of these channels). In addition to the west boundary of the Collom Lite Pit encroaching into the mainstem Collom Gulch drainage areas, the western portions of the external fills would also encroach into the watershed area; neither would directly disturb the Collom Gulch stream channel itself. Overall, the degree of surface water effects due to these aspects of Alternative B would be similar to Alternative A (i.e., *long term but* negligible to minor).

Out of the five seeps or springs within the Little Collom Gulch drainage area that would be eliminated by mining under Alternative A, only three (SPRLC-02, SPRLC-03, and V29) would be eliminated under Alternative B. However, the overall diminishment of stream flows due to reductions in these or other surface expressions of groundwater would be similar to Alternative A, as their contributions are considered to be minimal.

As with Alternative A, the combination of structural and non-structural BMPs under Alternative B would reduce potential surface water quality impacts due to spills and erosion to a negligible effect. While neither the sump nor the sediment control pond that are proposed under Alternative A would be used under Alternative B, three smaller sediment ponds would be constructed. Thus, Colowyo's CDPS permit would be amended or a new permit would be obtained, and the additional outfalls would be permitted according to state regulations.

Other aspects of surface water resource effects that were described above for Alternative A, such as TDS accumulation and reclamation activities, would be similar to those under Alternative B. Thus, as under Alternative A, Alternative B would also likely have overall *long-term,* negligible or minor effects on downstream surface water flows or water quality.

4.5.2.2 Groundwater

The potential loss of springs and/or spring flow under Alternative B was described above in the surface water subsection. Other impacts to groundwater, such as the interception of perched water or a more extensive saturated zone, and the resultant need for dewatering, would be similar to those under Alternative A (i.e., *long term but* negligible to minor).

4.5.3 Alternative C (No Action)

Under Alternative C, there would be no disruption of Project Area stream channels, and no effects to downstream flows or quality. Similarly, there would be no loss of springs or interception of groundwater and no impacts to downstream water users, aquifers, or groundwater quality.

4.5.4 Mitigation Measures

No mitigation measures would be necessary for water resources.

4.6 VEGETATION

4.6.1 Alternative A (Proposed Action)

Under Alternative A, the removal of topsoil and overburden would result in the gradual loss of plant communities on 2,090.5 acres (43.2 percent of the Project Area) (**Table 4.6-1**) associated with clearing for the proposed pits, temporary overburden stockpile, mine facilities, and along the proposed haul road. Impacts would be short term and would range from negligible (aspen type) to moderate (mountain shrub type) until reclamation replaced vegetation to the approved reclamation plan (or improved) conditions.

Table 4.6-1 Vegetation Disturbance under Alternative A

Vegetation Type[1]	Acres Disturbed	Percent of the vegetation type disturbed within the Project Area
Sagebrush	903.6	*40.5*
Mountain Shrub	866.1	*46.7*
Grassland	269.9	*51.5*
Bottomland	17.9	12.1
Aspen	7.9	*32.9*
Juniper Scrub	17.7	*42.5*
Cultivated Fields	4.9	*40.52*
Disturbed Areas	2.5	*49.0*
Total	2,090.5	

[1] Vegetation types include vegetation as well as other land cover classifications.

Impacts to vegetation would be lessened by the implementation of design features (**Section 2.3.16**). 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 GRSG habitat [**Section 4.9.2**]). Several growing seasons would be needed for revegetated areas to be restored to the PR03 vegetation standards (Section 4.15 in Colowyo [2011]). 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 to *long-term* negligible to minor with the continued application of herbicides as described in the weed control plan in PR03 (Colowyo 2011). Additionally, design features include protection afforded to vegetation resources from potential fugitive dust or spills of petroleum or other fluids from equipment, which would reduce these impacts to *long term* negligible.

4.6.2 Alternative B (Reduced Mining)

Impacts to vegetation resources would be similar to impacts under Alternative A. However, under this alternative, the Little Collom X Pit would not be mined. The temporary overburden stockpile and disturbance footprint would be redesigned resulting in an increase of 546.2 acres of disturbance to vegetation (54*.5* percent of the Project Area) (negligible to moderate, short-term impacts) **(Table 4.6-2)**. Other impacts to vegetation would be similar to those described under Alternative A.

Table 4.6-2 Vegetation Disturbance under Alternative B

Vegetation Type	Acres Disturbed	Percent of the vegetation type disturbed within the Project Area	Acreage increased or (decreased) from Alternative A
Sagebrush	1,261.4	*56.6*	357.8
Mountain Shrub	1,051.8	*56.7*	185.7
Grassland	235.5	*45.0*	(34.4)
Bottomland	38.7	26.1	20.8
Aspen	9.4	*39.0*	1.5
Juniper Scrub	25.4	*60.9*	7.7
Cultivated Fields	11.6	*95.9*	6.7
Disturbed Areas	2.9	*56.9*	0.4
Total	2,636.7		546.2

Additionally, under Alternative B the life of the Project would be reduced by four years. Reduction in the life of the Project would result in the final reclamation of the area occurring sooner than under Alternative A. Reclamation under Alternative B would occur according to the Reclamation Plan (**Appendix A**) approved under PR04 in the same manner as Alternative A.

4.6.3 Alternative C (No Action)

Under Alternative C, no surface disturbance would occur and there would be no impacts to the vegetation in the Project Area.

4.6.4 Mitigation Measures

No mitigation measures would be necessary for vegetation.

4.7 WETLANDS AND RIPARIAN ZONES

4.7.1 Alternative A (Proposed Action)

Under Alternative A, approximately 1.1 acres of jurisdictional wetlands would be directly disturbed and removed by development of the proposed pits, temporary overburden stockpile, mine facilities, and along the proposed haul road. *Mitigation required through the Section 404 permitting process with the USACE (**Section 4.7.4**) would reduce the effect to a minor, short-term impact.*

Additionally, alterations in the surface hydrology as a result of Alternative A would have the potential to affect downstream wetlands. Any disruptions to the streams that support wetlands would have the potential to dewater those areas. Any sediment runoff would have the potential to accumulate in downstream wetlands as a result of Alternative A, resulting in adverse impacts. However, these impacts are anticipated to be minor as the streams leading to these wetlands are intermittent and not likely to support these wetlands throughout the year.

Additionally, design features (**Section 2.3.16**) would reduce the potential for sedimentation. See **Section 4.6** for further discussion on impacts from sedimentation.

In addition to impacts to wetlands, Alternative A would impact a total of 16,485.1 linear feet (3.12 miles) of ephemeral channels (WOTUS) within the Little Collom Gulch and its unnamed tributaries. These channels have been preliminarily identified as jurisdictional. During the surveys conducted in 2006 and 2012, it was determined that the Little Collom Gulch has an average width of one foot for indicators. Therefore, under Alternative A, a total area of 0.38 acres of WOTUS would be impacted in addition to impacts to wetlands. *Mitigation required through the Section 404 permitting process with the USACE (**Section 4.7.4**) would reduce the effect to a minor, short-term impact.*

Colowyo has initiated the Section 404 permitting process with the USACE for jurisdictional wetlands and other WOTUS that cannot be avoided and that would be impacted within the Project Area.

4.7.2 Alternative B (Reduced Mining)

Impacts to wetlands under Alternative B would be similar to impacts under Alternative A. Under this alternative, a total of 1.3 acres of jurisdictional wetlands would be impacted. This is an increase of 0.2 acres beyond that of Alternative A. While there would be an increase in the overall amount of wetlands directly impacted under this alternative, there would potentially be fewer impacts to wetlands outside of the Project Area by eliminating disturbance to streams on the northern end of the Project Area. This would increase the sediment travel distance between disturbance and downstream wetlands.

In addition to impacts to jurisdictional wetlands, Alternative B would impact a total of 10,425.6 linear feet (1.97 miles) of ephemeral channels (WOTUS) within the Little Collom Gulch and its unnamed tributaries. During surveys conducted in 2006, these areas were determined as potentially jurisdictional under the CWA. Using an average of one foot width of the WOTUS channels, Alternative B would impact 0.24 acres of WOTUS in addition to impacts to wetlands.

*Similar to that under Alternative A, mitigation would be required through the Section 404 permitting process with the USACE (**Section 4.7.4**) which would reduce the effect to a minor, short-term impact under Alternative B.*

4.7.3 Alternative C (No Action)

Under Alternative C, no ground disturbing activities would occur. Therefore, there would be no impacts to wetlands or other WOUS in the Project Area.

4.7.4 Mitigation Measures

For jurisdictional wetlands and other WOTUS that cannot be avoided and that would be impacted within the Project Area, Colowyo has initiated the Section 404 permitting process with the USACE. Mitigation for the loss of wetlands and WOTUS would be coordinated and determined through the 404 permitting process and could be in the form of mitigation wetland credits or creation/enhancement of new wetlands. USACE is the agency in charge of wetlands and is ultimately responsible for the wetland determination.

4.8 FISH AND WILDLIFE RESOURCES

4.8.1 Alternative A (Proposed Action)

Design features (**Section 2.3.16**) would provide wildlife protection and habitat restoration during reclamation. To reduce impacts related to 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 the Colowyo Coal Mine addresses active nests found in future disturbance areas, a protocol on nest location, and consultation with the appropriate state authorities. Measures in the avian protection plan would include:

- Prior to commencement of grubbing and topsoil removal, 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.

*I*mpacts to wildlife would occur primarily through gradual loss of habitat and disturbance by mining and human presence. These impacts, as described below, would be *long-term* 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 wildlife 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 and human activity would cease.

4.8.1.1 Mammals

Under Alternative A, impacts to mammals would occur primarily from the loss of habitat. Approximately 2,090.5 acres of potential habitat would be lost from the two pits, mine facilities, new haul road, and other disturbances. Given the relatively small area that is proposed to be disturbed, and the amount of similar undisturbed habitat that is available adjacent to the Project Area both within and outside the mine boundary, this impact would be *long-term and* minor as there would be other areas for these species to displace and move into.

Mortality to smaller, burrowing mammal species may occur during construction and mining activities if individuals retreated underground rather than leaving the area. Additionally, some mortality would potentially occur from vehicle operations along the Project roads. This impact would be negligible to minor and short term.

Impacts to habitat for mammals would be offset by reclamation that would be continuing in areas of the current mining operation. Therefore, while new areas are being disturbed, previously disturbed areas would be reclaimed and become available again for mammal use.

4.8.1.2 Big Game

Impacts to big game species would potentially result from the construction of the two pits, mine facilities, and the 5.5 mile access road, displacement during mining operations, loss of forage on 2,090.5 acres of disturbed lands, noise from vehicles and equipment, and potential mortality from vehicle collisions.

Elk, pronghorn, and mule deer can be found in the Project Area in the summer and winter. Mapped mule deer and elk concentration areas, elk severe winter areas, and elk production areas would have minor to moderate, short-term impacts under Alternative A (**Table 4.8-1**). Although big game would tend to be displaced from disturbed areas and away from active mining activities, based on observations at the existing mining operations within the mine boundary, both elk and 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. Additionally, impacts from displacement would be offset given the overall amount of similar habitat available outside of the Project Area.

Table 4.8-1 Big Game Habitat Directly Impacted by Alternative A

Big Game Habitat	Acres Impacted	Percent of Mapped Range disturbed within the Project Area
Elk Resident Range	562.4	50.2
Elk Winter Concentration Area	853.2	*34.4*
Elk Winter Range	2,090.5	43.2
Elk Severe Winter Range	318.5	*24.9*
Elk Production Area	562.4	50.2
Mule Deer Winter Concentration	1,044.0	*36.9*
Mule Deer Winter Range	1,672.0	*41.1*

4.8.1.3 Migratory Birds

Impacts to migratory birds within the Project Area could include destruction of nests and eggs in unidentified nests if clearing activities occur during nesting seasons and those nests are not found and subsequently avoided; design features (**Section 2.3.16**) *and implementation of the measures in the permit (***Section 4.8.1***)* would reduce this to a *short-term* negligible to minor impact. Approximately 2,090.5 acres of land would be disturbed under Alternative A. Of this, most of the area would provide some habitat for migratory birds, including nesting habitat. However, these habitats are available outside the Project Area, and therefore, this impact would be *long-term and* minor.

In addition to the loss of habitat, the construction of a new 5.5 mile haul road would have an impact on migratory birds. Inglefinger (2001) found evidence that densities of sage-brush obligate songbirds declined within 100 meters of natural gas access roads, even under light traffic volumes (less than 12 vehicles per day), although horned lark abundance increased within 100 meters of roads, where they may forage on windblown seeds that collect in the road. Sutter et al. (2000) found numerous species of grassland birds (e.g., Sprague's pipit [*Anthus spragueii*], Baird's sparrow [*Ammodramus bairdii*]) to be less abundant along roads than trails. However, these habitats are available outside the Project Area, and therefore, this impact would be a *long-term,* minor impact on migratory birds.

Noise produced by mining operations would also have the potential to impact 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 (Larking 1996, USDI 2003). These impacts would be *long term and* minor.

The proposed construction of the power line associated with Alternative A would have the potential to *displace* migratory birds *during construction activities. If construction occurs during the nesting season, surveys would be conducted by a qualified biologist before construction to ensure the Project does not result in the "take" of an active nest, egg, or bird protected by the Migratory Bird Treaty Act.* This impact would be considered a negligible to minor *short*-term impact. However, the potential for increased predation is not expected to reduce or expand a species' existing distribution.

4.8.1.4 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 2.3.16**) to a *long-term,* negligible to minor impact. Therefore, the primary impacts that may result to raptors under this alternative would be from loss of habitat and disturbance to individuals*, although these impacts would be minimized through implementation of the avian protection plan*. Potential future nesting locations and foraging habitat within 2,090.5 acres would be removed. Noise and human presence has the potential to disturb individuals that forage in the area. Given the amount of similar habitat outside the Project Area, this impact would be *long term and* minor.

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 nest 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 no active nests are located within the Project Area, two nests previously occupied by red-tailed hawk and common raven [*Corvus corax*]) in 2011 are located within 0.5 mile of the proposed access road. Four previously inactive nests are located within the disturbance footprint and would be removed. The species associated with these inactive nests included Cooper's hawk, long-eared owl, and common raven. An additional 17 inactive nests have been located within 0.5 mile of the disturbance footprint. Any nests would be checked for activity status prior to their removal and if any are active, they would be lawfully removed after the young had fledged. These measures would result in negligible*, long-term* impacts to nesting raptors.

Mortality to raptor species from the Project is not likely to occur as most species are highly mobile and are able to leave the area. However, some species that feed on carrion or roadkill would be at risk of vehicle collisions along the haul road and other mine roads although this has not been reported to have occurred at the mine.

The operational impacts to migratory birds, including raptors, are electrocution and collision risk. Power lines provide perching and in some cases nesting substrate in habitats devoid of trees and rock outcrops. Avian electrocutions are more common on distribution level voltages, such as the 69kV line proposed. An electrocution can occur when a bird completes an electric circuit by simultaneously touching two energized parts or an energized part and a grounded part of the electrical equipment. Avian electrocution risks will be reduced through incorporation of APLIC guidance (e.g. spacing and placement of lines on the poles, shielding, etc.).

4.8.1.5 Reptiles and Amphibians

Impacts to reptiles and amphibians would be similar to the impacts described in **Section 4.8.1.1**. In addition to the 2,090.5 acres of habitat lost, some mortality may occur from construction, mining activities, and vehicle operation. The loss of approximately 1.1 acres of wetlands would impact amphibian populations in the Project Area. Overall, the amount of similar habitat available to reptiles and amphibians outside the Project Area would offset the impacts from displacement resulting in *long-term,* negligible to minor impacts.

4.8.1.6 Fisheries

As there are no perennial streams within the Project Area, no direct impacts to the fisheries near the Project Area are anticipated to occur. Implementation of design features (**Section 2.3.16**) would reduce the likelihood of sediment or a spill of petroleum products or hazardous materials from reaching fish-bearing streams. Potential indirect impacts to fisheries are provided in **Section 4.9**, specifically to the federally listed Colorado River fish. The nearest habitat for these species is located in the Yampa River approximately 11 miles (18 km) from the Project Area and 17 miles (27 km) from the proposed surface disturbance.

4.8.2 Alternative B (Reduced Mining)

4.8.2.1 Mammals

Impacts to mammals under this alternative would be similar to Alternative A. However, the elimination of the Little Collom X Pit and the redesign of the temporary overburden stockpile and disturbance footprint would increase the surface disturbance by 546.2 acres and reduce the life of the Project by approximately four years. This would result in a slightly greater increase of impacts to mammals from the loss of habitat, as well as increasing the potential for mortality to occur; the severity of these impacts would still be the same as under Alternative A. The reduction in the life of the Project would reduce other potential impacts to mammals by approximately four years from mining related activities.

4.8.2.2 Big Game

Impacts to big game species under this alternative would be similar to Alternative A. However, the elimination of the Little Collom X Pit and the redesign of the temporary overburden stockpile and disturbance footprint would increase the surface disturbance by 546.2 acres and reduce the life of the Project by approximately four years; the severity of these impacts would still be the same as under Alternative A. The reduction in the life of the Project would reduce other potential impacts to big game by approximately four years from mining related activities. The Little Collom X Pit and redesign area would affect mapped big game habitat as shown in **Table 4.8-2**.

Table 4.8-2 Big Game Habitat Impacted under Alternative B

Habitat Type	Acres Impacted	Percent of mapped range impacted in the Project Area	Percent increase/(decrease) from Alternative B
Elk Resident Range	688.4	61.4	22.4
Elk Concentration Area	854.7	34.8	0.2
Elk Winter Range	2,636.7	54.7	26.1
Elk Severe Winter Range	235.4	18.5	(26.1)
Elk Production Area	688.4	61.4	22.4
Mule Deer Winter Concentration	1,186.6	42.0	13.7
Mule Deer Winter Range	1,949.5	47.9	13.6

4.8.2.3 Migratory Birds

Impacts to migratory birds under this alternative would be similar to Alternative A. However, the elimination of the Little Collom X Pit and the redesign of the temporary overburden stockpile and its disturbance footprint would increase the surface disturbance by 546.2 acres, and the life of the Project would be reduced by approximately four years. This increase in surface disturbance would result in slightly greater impacts to migratory birds when compared to Alternative A; the severity of these impacts would still be the same as under Alternative A. However, the reduction in the life of the Project would reduce other potential impacts to migratory birds by approximately four years from mining related activities.

4.8.2.4 Raptors

Impacts to raptors under this alternative would be similar to Alternative A. However, the elimination of the Little Collom X Pit and the redesign of the temporary overburden stockpile and disturbance footprint would increase the surface disturbance by 546.2 acres, and the life of the Project would be reduced by approximately four years. This increase in surface disturbance would result in a slight increase in impacts to habitat for raptors; the severity of these impacts would still be the same as under Alternative A. However, the reduction in the life of the Project would reduce the impacts to raptors. Under this alternative, the same two active nests that occur within 0.5 mile of the access road would be impacted, as under Alternative A. However, the elimination of the Little Collom X Pit would maintain the four inactive nests that would be directly impacted under Alternative A and would reduce the number of inactive nests in the 0.5 mile buffer to eight (17 under Alternative A). Reducing the number of nests impacted would reduce the overall impacts to raptors in the Project Area (*long-term,* negligible) under Alternative B when compared with Alternative A.

4.8.2.5 Reptiles and Amphibians

Impacts to reptiles and amphibians under this alternative would be similar to Alternative A. However, the elimination of the Little Collom X Pit and the redesign of the temporary overburden stockpile and disturbance footprint would increase the surface disturbance by 546.2 acres and the life of the Project would be reduced by approximately four years. This increase in surface disturbance would result in slightly greater impacts to reptiles and amphibians; the severity of these impacts would still be the same as under Alternative A. However, the reduction in the life of the Project would reduce the impacts to reptiles and amphibians by allowing the area to be returned to potential habitat sooner than for Alternative A.

4.8.2.6 Fisheries

The Project Area does not contain perennially flowing waters and therefore does not support any fisheries; therefore, there would not be any impacts to fisheries.

4.8.3 Alternative C (No Action)

Under Alternative C, surface disturbing activities would not occur in the Project Area and there would be no impacts to wildlife resources in or near the Project Area.

4.8.4 Mitigation Measures

No mitigation measures would be necessary for wildlife.

4.9 SPECIAL STATUS SPECIES

4.9.1 Alternative A (Proposed Action)

Design features (**Section 2.3.16**) would be implemented to reduce the impacts 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 *short term and* minor under Alternative A.

4.9.1.1 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 2.3.16**) associated with Alternative A, it is unlikely that these species would be impacted by sediment or spills.

Water depletion for mine operations under Alternative A is anticipated to be approximately 36 acre-feet per year. This depletion would result in adverse impacts to the Colorado River fish species (USFWS 2012). The USFWS BO for PR03 (**Appendix C**) 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 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.
>
> 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. Re-initiation 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 less than 100 af/year, no recovery fees are necessary. 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 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 Generating 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 individuals 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 Mine 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 of Alternative A on 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 indirectly from Alternative A may be minor *and long term*. However, when added to the other regional and global sources of mercury deposited into the area, Alternative A may result in cumulatively adverse impacts (**Section 5.4.8**).

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 the Colowyo Coal Mine and the existing controls at the Craig Generating Station, an average amount of 47 lbs of mercury would be emitted annually from the Station including the Colowyo Coal Mine coal mined under Alternative A. 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 modeling 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 wet weight 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 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 conducted for Alternative A, that consultation did not include the impacts for mercury or selenium. Consultation with USFWS for Alternative B did include those potential impacts *and is described in* ***Section 4.9.2***. In general, indirect impacts to the Colorado River fish from mercury and selenium under Alternative A would be moderate *and long term*.

Western Yellow-billed Cuckoo

Because there is no habitat in the Project Area for WYBCs, impacts would be limited to indirect impacts resulting from Colowyo coal combustion and subsequent mercury emission at the Craig Generating Station. For the WYBC, 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 indirect 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 Yampa River invertebrates within the region. However, it could be assumed that given the levels of mercury that currently exist in the Yampa River (the analysis area for this species related to the potential indirect impacts from the Project), that the aquatic invertebrates may contain elevated levels of mercury. Any WYBCs present in the analysis area would be at risk for mercury contamination. Therefore, Alternative A would have the potential to adversely indirectly affect this species through the combustion of Colowyo coal. However, that risk would be low considering that the primary food sources for the WYBC 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 to the species as a whole given there is no threshold information for WYBCs 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 WYBCs that inhabit the region. Given the low numbers of WYBCs that are thought to reside in the area, it would be difficult to obtain this data.

The WYBC may not return to the same breeding areas in successive years, therefore 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 WYBCs 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 WYBCs, the proposed critical habitat for this species may also be *indirectly* impacted by Alternative A. The USFWS has designated critical habitat for the western yellow billed WYBC 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 indirectly impact critical habitat through adverse impacts to the WYBC'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 indirectly result in some level of mercury deposition in the analysis area. Some of this mercury may affect the invertebrates that make up the WYBC'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 WYBCs. It is not known how much of the mercury deposited would be generated from Colowyo Coal Mine coal burned at the Craig Generating Station. Therefore, it is not possible to determine the severity of this indirect 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, *long-term* indirect impacts to the WYBC.

4.9.1.2 State Listed and BLM Sensitive Species

Great Basin Spadefoot

The primary impact to this species would occur from a loss of 1,787.4 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 1,153.7 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.

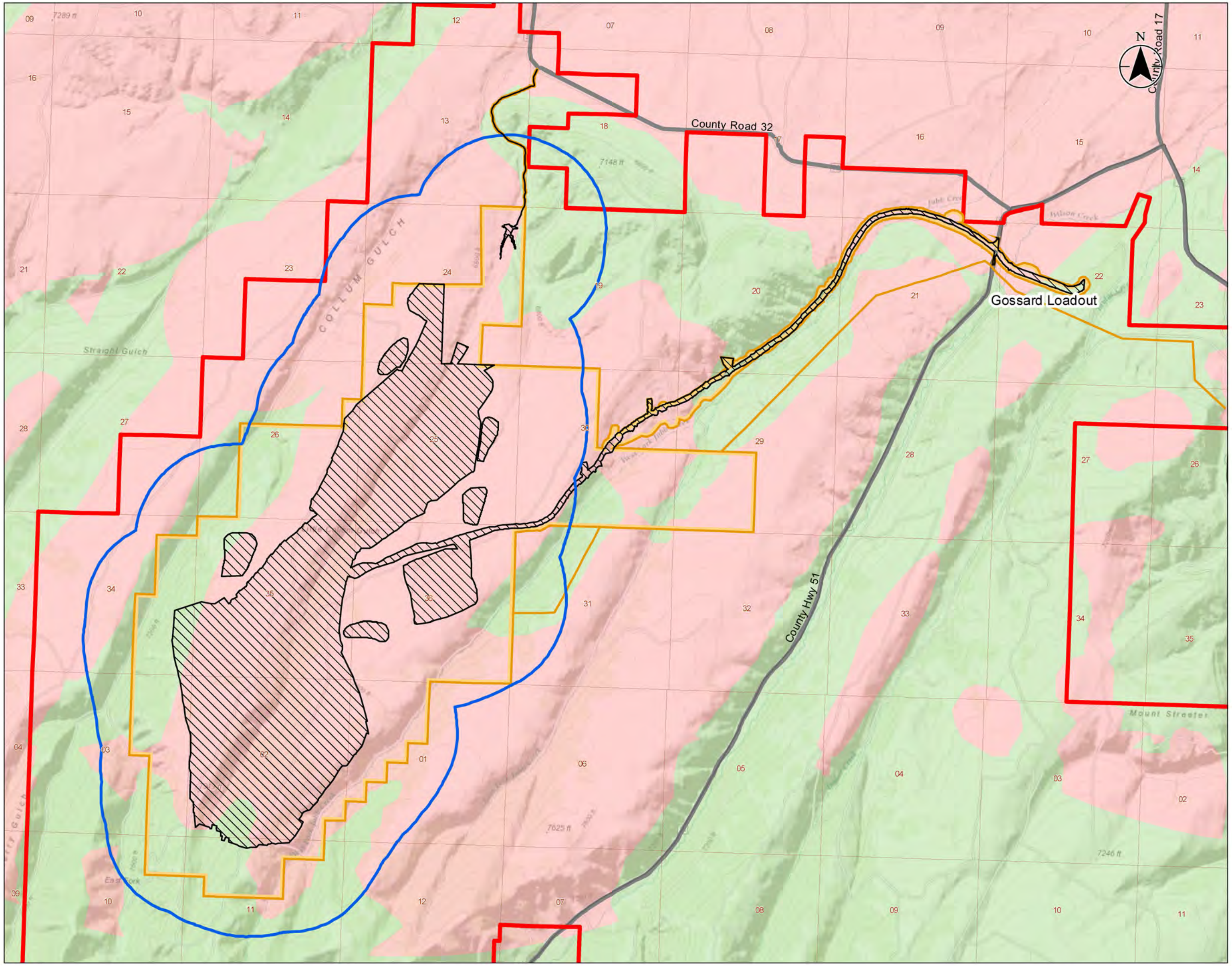
Greater Sage-grouse

The primary impact to GRSG under Alternative A would occur from direct disturbance, displacement of individuals, direct loss of habitat, and a potential increase*d risk* of predation from *raptors and corvids perching on the 69kV line* (CGSSC 2008). The use of perch d*iscouragers* on the power line *may reduce* the *time raptors and corvids perch on the line*.

Alternative A would impact approximately 1,829.4 acres of mapped PHMA, which would be a *long-term,* major impact. The majority of the habitat is located within sagebrush or shrubland vegetation types. A minor amount of GHMA habitat would be impacted by comparison (98 acres). In addition to the direct impacts, consultation with CPW, BLM, and USFWS biologists determined that indirect impacts would occur out to 900 meters (2,953 feet) from the edge of disturbance (B. Holmes, CPW, personal communication June 25, 2014). This distance was determined based on several years of monitoring data from the Axial Basin, where the Colowyo Coal Mine is located and GRSG occur near existing mining. **Table 4.9-1** outlines the GRSG habitat classifications potentially impacted by Alternative A including production, brooding, and winter habitat (**Figures 4-4** and **4-5**). Reclamation would focus on improving GRSG habitat, including boosting available GRSG forage and brood production, in disturbed areas. This would be a long-term benefit to GRSG and would lessen the impact to PHMA.

The following design features (**Section 2.3.16**) would specifically benefit GRSG:

- Colowyo would incorporate the utilization of marking flags on perimeter fences in the Project Area to minimize incidents of GRSG mortality through bird/fence collisions.
- Colowyo would treat NPDES discharge ponds for mosquitos to reduce the potential of West Nile Virus transmission to local GRSG populations if this treatment is not specifically precluded by CDPHE regulation of the Colowyo Coal Mine's discharge ponds.



- Road
- Disturbance Area
- Approved SMCRA Permit Boundary
- Project Area

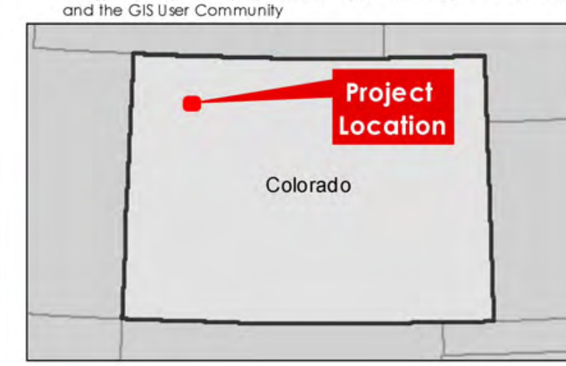
Greater Sage-Grouse

- Indirect Impact Area (900 Meter Buffer)
- General Habitat Management Area (GHMA)
- Priority Habitat Management Area (PHMA)

0 2,000 4,000
Feet
1:40,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

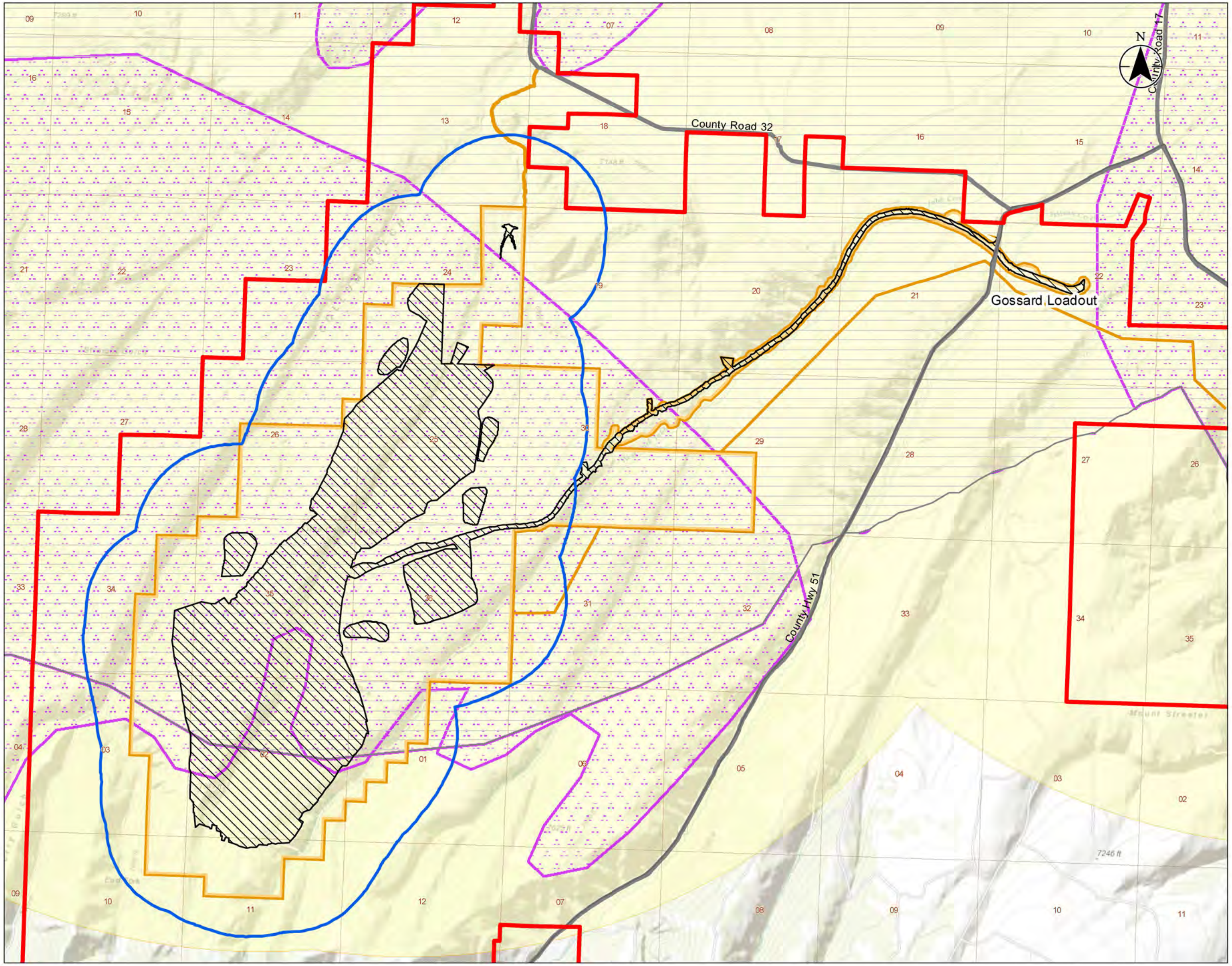


Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.
4-4

Title
Alternative A,
GRSG Priority and General Habitat
Impact Analysis Area



Road
Disturbance Area
Project Area
Approved SMCRA Permit Boundary

Greater Sage-Grouse

Indirect Impact Area (900 Meter Buffer)

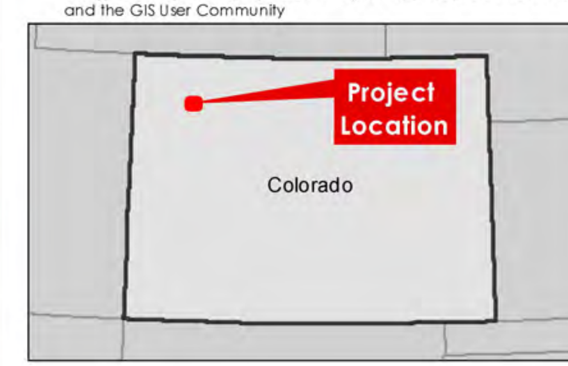
Other Greater Sage-Grouse Habitat Types

Sage-Grouse Winter Range
Sage-Grouse Brood Areas
Sage-Grouse Production Areas

0 2,000 4,000 Feet
1:40,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.
4-5

Title
**Alternative A,
Other Greater Sage-Grouse
Habitat Impact Analysis Area**

Table 4.9-1 Disturbance to GRSG Habitat Types under Alternative A

Habitat Designation	Acres Directly Disturbed	Percent of total habitat type directly disturbed in the Project Area	Acres Indirectly Disturbed within a 900 meter buffer[1,2]	Total Acres Disturbed (Direct & Indirect)
PHMA	1,829.4	47.0	3,022.4	4,851.8
GHMA	98.0	10.3	61.7	159.7
Production Area	2,090.5	43.1	4,556.0	6,646.5
Brooding Habitat	1,610.5	40.6	3,054.6	4,665.1
Winter Range	1,634.2	39.7	3,628.5	5,262.7

[1] Indirect impacts acreage does not include the access road, as data in the Axial Basin has shown that GRSG in the region do not avoid roads (B. Holmes, CPW, personal communication, June 25, 2014).

[2] The buffer distance of 900 meters was determined based on telemetry data from marked GRSG in the Axial Basin. The data show that GRSG typically remain this distance from mining operations (B. Holmes, CPW, personal communication, June 25, 2014).

Short-term and long-term direct impacts would occur by habitat removal, through construction of the Project, and through noise during construction and mining activities. Lek SG4 is located approximately 320 feet from the Little Collom X Pit. Though construction impacts would be transitory *(short term)*, there is the potential for minor to moderate impacts should these activities occur during the breeding season or when nesting and brood-rearing hens are in close proximity to these activities. Fences have been implicated in direct mortality to GRSG as a result of collision or indirectly by providing perches for raptors, leading to increased predation (Knick et al. 2011). Also, the presence of roads and power lines may provide easy travel corridors to terrestrial GRSG predators (Chesness et al. 1968, Mankin and Warner 1992). Communication towers and electrical distribution lines have been implicated as collision hazards to many birds including GRSG (Wisdom et al. 2011, APLIC 2012, CGSSC 2008). Furthermore, for hens seeking brood-rearing habitat within the Project Area, the mining areas, associated facilities, and increased human presence may impede access to this habitat by preventing the hens from travelling along established routes. These effects may be minor to moderate and long-term depending on how hens move from nesting to brood-rearing habitat and whether the individuals acclimate to human presence or relocate to other habitat during the life of the mine. After reclamation is complete, GRSG would be able to reestablish use in these areas.

Any disturbance to GRSG that would preclude birds from attending the lek or limit access to habitat (i.e., PHMA, GHMA, etc.) would be considered moderate. However, major impacts to the population are not considered likely as the Axial Basin has one of the highest population levels of GRSG in Colorado. Lek counts during the 2015 season within the Basin, and Moffat County in general, were higher than in previous years (CPW 2015b). The Axial Basin population occurs within the CPW Management Zone 5 for GRSG. In 2015, leks occurring on or near Colowyo land in this zone had a total lek count of 625 males, of which 48 were on lek SG4. In addition, within the region, there were seven other leks that had equal to or similar numbers of males attending in 2015. Therefore, impacts to this lek would not likely affect the entire population of GRSG in this zone. Within the vicinity of the Project Area, direct and indirect impacts from Alternative A have the potential to affect approximately 46 percent of the tracked birds in the Axial Basin population to some degree (B. Holmes, CPW, personal communication February 20, 2014).

Short- and long-term noise-related impacts would occur at lek SG4 and could reduce numbers at the lek or preclude lek attendance, potentially causing SG4 to become inactive. These impacts would be considered a moderate impact during the life of the Project given the fact that an estimated 10 percent of the GRSG in the Axial Basin have visited this lek (B. Holmes, CPW, personal communication, February 20, 2014).

Several design features have been identified for GRSG (**Section 2.3.16**). However, given the proximity of lek SG4 to the Little Collom X Pit and the likelihood that this lek would be abandoned under Alternative A, impacts to GRSG would be moderate to severe.

Mountain Plover

Impacts to the mountain plover would occur primarily through a loss of 274.8 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 *long-term,* negligible impact on this species.

Bald Eagle

Mining within the Project Area would disturb 2,090.5 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 2.3.16**) 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 *long term,* 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 in several ways, including loss of habitat, increased mortality, and loss of leks.

Primarily, Alternative A would result in the removal of 2,052.5 acres of habitat. Of the mapped habitat within the area, Alternative A would remove approximately 1,888.4 acres of mapped winter habitat and 1,247.9 acres of production habitat. This is approximately *39.9* percent and 35.3 percent of the mapped winter and production habitat within the Project Area, respectively. However, Alternative A would only directly disturb 4.9 percent and 7.1 percent of the mapped winter and production habitat, respectively within the vicinity of the Project Area. This disturbance would occur *long term* over the life of the Project, approximately 20 to

40 years. Overall, this impact is anticipated to be minor given the large amount of similar suitable habitat that is present in the vicinity of the Project Area for Columbian sharp-tailed grouse.

In addition to lost habitat for this species, Alternative A would impact Columbian sharp-tailed grouse leks within the vicinity of the Project Area. While no leks would be directly removed, the 11 leks that occur in and within two kilometers of the Project Area may be impacted. Of these 11 leks, seven were active at the last count in 2011. Increased noise and human activity in the area would have the potential to cause some of these leks to be abandoned. Leks closest to the disturbance area would be at the greatest risk of abandonment while those farther away would be less susceptible due to attenuation of noise and topographic screening in the form of high ridgelines and steep valleys.

The increase of human activity and disturbance in a relatively undisturbed area would also have the potential to increase mortality for Columbian sharp-tailed grouse. Increased vehicle traffic would increase the potential for vehicle-grouse strikes. Increased human presence may draw in known predators such as foxes, skunks, crows, and owls (Hoffman and Thomas 2007). Finally, the construction of a power line and fence lines would increase the risk of collisions between grouse and these features (APLIC 1994, Pattern et al. 2005).

This loss of habitat would be offset by ongoing reclamation efforts at the current mining areas and by contemporaneous reclamation that would occur at the new mining areas. 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 Colowyo Coal Mine (T. Tennyson, personal communication 2014). Proper disposal of refuse would limit the potential for predators to increase in the area, and marking the transmission line and fence lines would aid in reducing mortality.

<u>Burrowing Owl</u>

Impacts to burrowing owls would occur primarily through a loss of 2,039.6 acres of habitat that may contain holes for burrowing owls. Design features (**Section 2.3.16**) would be employed that reduce the potential for impacts related to power lines. *Additionally implementation of Colowyo's design features would help ensure that no active nests or individuals are 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.

<u>American Peregrine Falcon</u>

Impacts to peregrine falcons would occur primarily through a loss of 2,090.5 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 1,769.7 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*, despite efforts to minimize impacts to nests with avian protection measures*. 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 1,795.3 acres of foraging habitat. There is a potential for increased mortality to this species from vehicle collisions under Alternative A. Because work would occur 24-hours a day, insects may be attracted to the lights used during night-time operations. This in turn could draw in foraging Townsend's big-eared bats and place them at risk from collisions with facilities or vehicles. Implementation of design features (**Section 2.3.16**) would limit vehicle speeds to minimize impacts to this species. 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.

White-tailed Prairie Dog

Impacts to white-tailed prairie dogs would occur primarily through a loss of 2,039.6 acres of habitat. In addition to a loss of habitat, individual white-tailed prairie dogs within the disturbance footprint could be killed during surface disturbing activities. 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.

4.9.2 Alternative B (Reduced Mining)

Overall, impacts to special status species under Alternative B would be similar to Alternative A. The elimination of the Little Collom X Pit and the redesign of the Collom Lite Pit would result in an increase of 546.2 acres of disturbance to a total of 2,636.7 acres. This represents an increase of approximately 26 percent of disturbance to special status species habitat, which would be a moderate effect.

However, under this alternative, the elimination of mining at the Little Collom X Pit would reduce the life of the mine by approximately four years. This would have an overall benefit to special status species by allowing final reclamation of the area to occur and the Project Area to return to pre-disturbance conditions four years sooner than under Alternative A.

Specific differences to special status species under Alternative B compared to Alternative A are described below. If a species is not listed in this section that is present in **Section 4.9.1**, there would be no change to the impacts previously described other than those listed above.

4.9.2.1 Threatened, Endangered, and Candidate Species

Colorado River Fish Species

Under Alternative B, the elimination of the Little Collom X Pit would eliminate the disturbance at the northern portion of the Project Area. This would reduce the potential for sedimentation and degradation of the intermittent streams in the Project Area from being delivered downstream to the Yampa River where these species occur.

Impacts from mercury and selenium would be similar to those described under Alternative A. However, as less coal would be mined under Alternative B, impacts from Colowyo coal would be reduced because there would be less mercury and selenium emitted from the combustion of Colowyo coal at the Craig Generating Station. Colowyo has committed to fund a monitoring program in support of a study on mercury deposition. *In a Biological Opinion prepared by the USFWS (**Appendix C**), 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 species from Alternative B would be moderate and long term.*

Overall, impacts to the Colorado River fish species would be less than those under Alternative A given the greater distance to the Yampa River from the proposed disturbance and less coal being mined.

4.9.2.2 State Listed and BLM Sensitive Species

Greater Sage-grouse

Impacts to GRSG under Alternative B would be reduced compared to those under Alternative A. Primarily, the reduced impact would occur from the elimination of the Little Collom X Pit and the redesign of the temporary overburden stockpile. This redesign would locate surface disturbance at least approximately 0.9 mile away from lek SG4 in comparison to 320 feet for Alternative A, which would reduce the impact to lek SG4 to a *long term and* minor impact. While the nearest disturbance would occur approximately 0.7 mile from this lek, that disturbance would be limited to the sediment control features (i.e. pond and sump). The temporary overburden stockpile *would be located 0.9 miles from the SG4 lek and* would receive less human disturbance and noise than where mining occurs at the Collom Lite Pit. *Surface disturbing activities at the overburden stockpile would not be allowed during the lekking and brood rearing season within 1.0 miles of the SG4 lek.* Under Alternative B, the Collom Lite Pit would be approximately two miles away from lek SG4.

Based on local and regional data collected by CPW in the Axial Basin, it is anticipated that with a 0.9 mile buffer, male attendance at lek SG4 is more likely to persist throughout the life of the Project (B. Holmes, CPW, personal communication, February 20, 2014).

Alternative B would result in an increase in the amount of land disturbed compared to Alternative A by 546.2 acres to a total of 2,636.7 acres; however this disturbance would occur approximately 0.9 mile from lek SG4. **Table 4.9-2** depicts the impacts to the mapped GRSG habitat from this alternative. These habitats are shown on **Figures 4-6** and **4-7**.

Under Alternative B, there would be an increase in the overall amount of GRSG mapped habitat directly impacted. While most of this disturbance would occur from the redesign of the temporary overburden stockpile, approximately 78 acres would result from construction of the haul road. Under Alternative B, a 100 foot disturbance buffer on either side was factored in to the haul road. As GRSG are known to occur near county roads in the Axial Basin, this buffer is anticipated to account for any indirect impacts to birds in the vicinity of the road. With the exception of GHMA, there would be fewer acres of mapped GRSG habitat impacted (direct plus indirect) under Alternative B when compared to Alternative A.

Table 4.9-2 Disturbance to Other GRSG Habitat Types under Alternative B

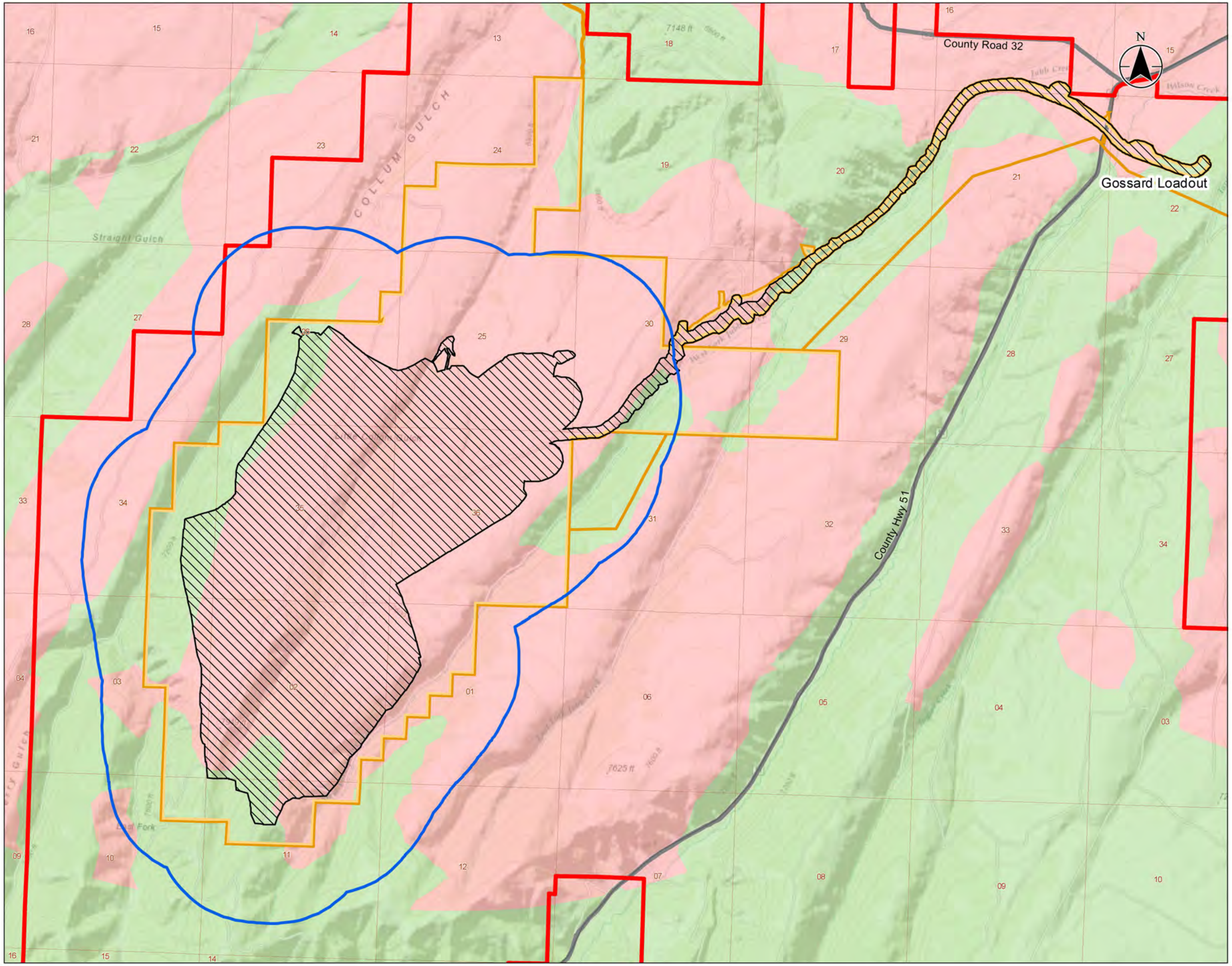
Habitat Designation	Acres Directly Disturbed	Percent of total habitat type Directly Disturbed in the Project Area	Acres Indirectly Disturbed within a 900 meter buffer[1,2]	Total Acres Disturbed (Direct and Indirect)	Total acreage increased/ (decreased) from Alternative A
PHMA	2,133.0	54.7	2,180.0	4,313.0	(538.8)
GHMA	271.9	*28.7*	58.6	330.5	170.8
Production Area	2,405.0	49.7	3,664.0	6,069.0	(577.5)
Brooding Habitat	1,794.5	45.2	2,557.1	4,351.6	(313.5)
Winter Range	2,013.8	49.*0*	2,465.4	4,479.2	(783.5)

[1] Indirect impacts acreage does not include the access road, as data in the Axial Basin has shown that GRSG in the region do not avoid roads (B. Holmes, CPW, personal communication, June 25, 2014).
[2] The buffer distance of 900 meters was determined based on telemetry data from marked GRSG in the Axial Basin. The data show that GRSG typically remain this distance from mining operations (B. Holmes, CPW, personal communication, June 25, 2014).

Under Alternative B, the life of the mine would be reduced four years. This would result in reclamation occurring sooner than under Alternative A and the disturbance area becoming available for GRSG use sooner than under Alternative A.

Other impacts as described for Alternative A would be similar under this alternative. However, under Alternative B, several design features specific to GRSG would be enacted to further avoid, minimize, and reduce the potential impacts to GRSG. A detailed discussion of these features is presented in **Section 2.4** and summarized below.

The primary feature is the redesign of the temporary overburden stockpile under Alternative B to increase the distance between the disturbance footprint and lek SG4 to approximately 0.9 mile. The 2011 LSFO ROD and approved RMP require NSO for surface disturbing activities within 0.6 mile of a lek (BLM 2011). Similarly the Northwest Colorado Greater Sage-Grouse Approved RMP Amendment and Rocky Mountain Region ROD will also require NSO within 0.6 mile of a GRSG lek (BLM 2015a). Increasing the distance between the disturbance footprint and lek SG4 to 0.9 mile under Alternative B would exceed the NSO radius required under the 2011 RMP and the approved GRSG RMP Amendment by about 50 percent. Note that Colowyo's federal coal leases were issued prior to the 2011 RMP and as VER, are not subject to the management decisions of the 2011 RMP or GRSG Amendment, except for the required lease modification (**Section 1.4.2**). Alternative B would substantially reduce the amount of



- Road
- Disturbance Area
- Approved SMCRA Permit Boundary
- Project Area

Greater Sage-Grouse

- Indirect Impact Area (900 Meter Buffer)
- General Habitat Management Area (GHMA)
- Priority Habitat Management Area (PHMA)

0 2,000 4,000 Feet
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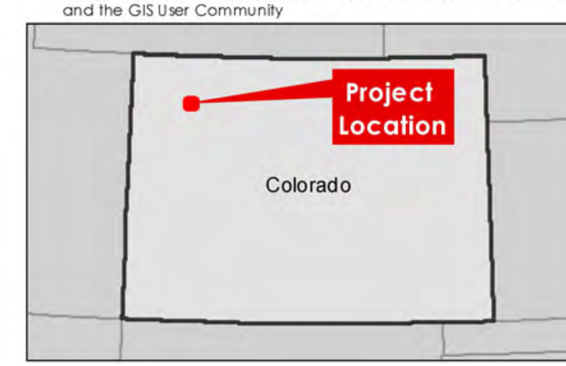
Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Basemap: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

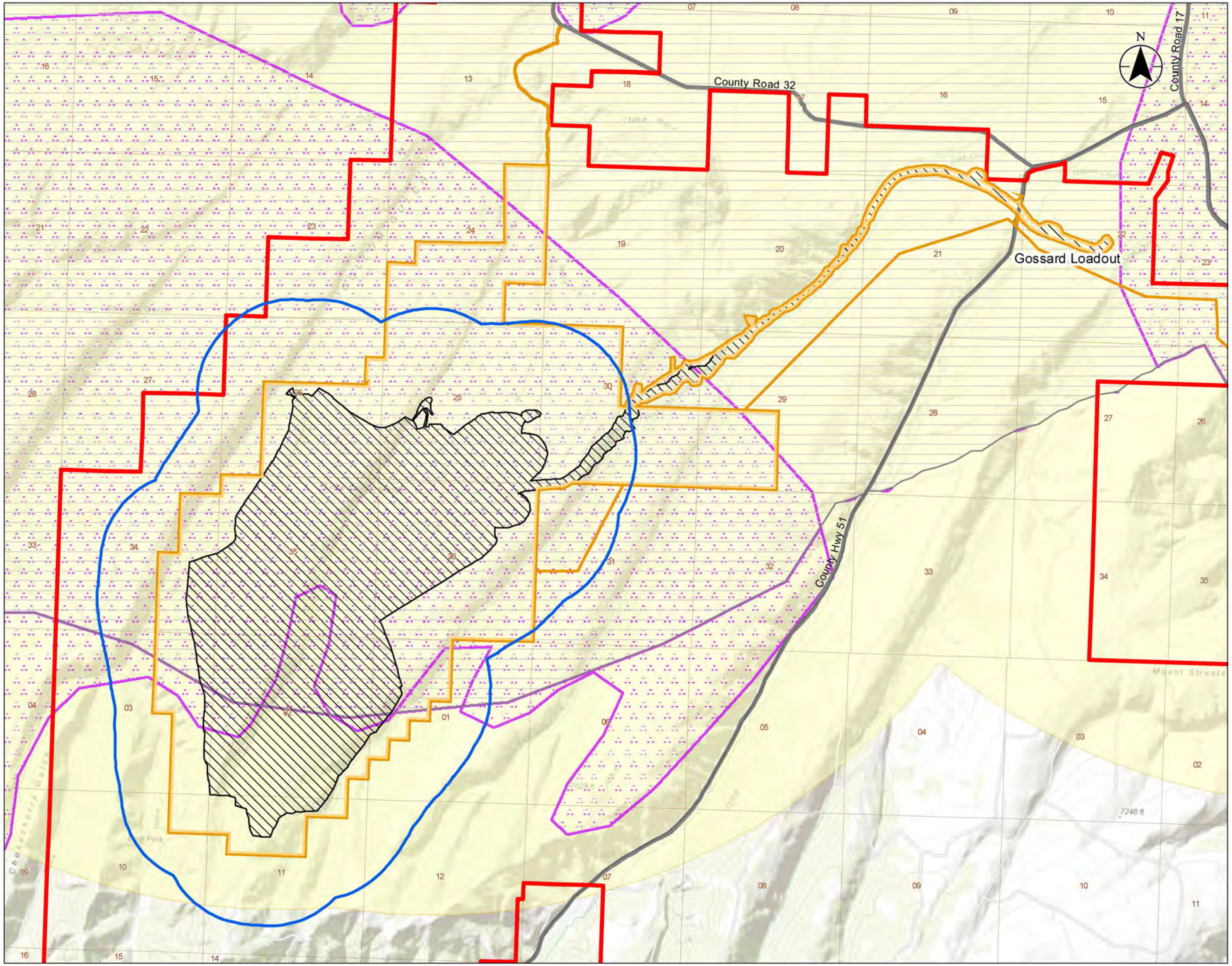


Project Location
Rio Blanco & Moffat Counties
Colorado

Project
Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.
4-6

Title
Alternative B,
GRSG Priority and General Habitat
Impact Analysis Area



- Road
- Project Area
- Disturbance Area
- Approved SMCRA Permit Boundary

Greater Sage-Grouse

- Indirect Impact Area (900 Meter Buffer)

Other Greater Sage-Grouse Habitat Types

- Sage-Grouse Winter Range
- Sage-Grouse Brood Areas
- Sage-Grouse Production Areas

0 2,000 4,000 Feet

1:40,000 (At original document size of 11x17)

Notes

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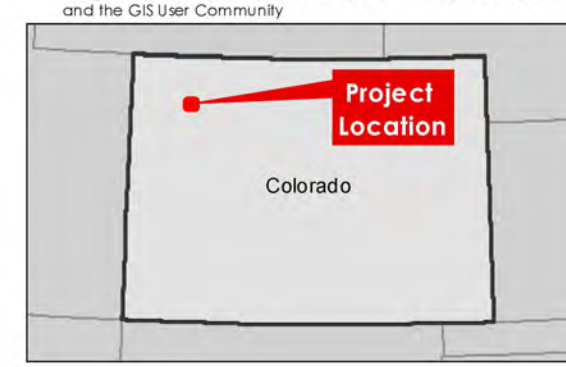
2. Basemap: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



Project Location

Rio Blanco & Moffat Counties
Colorado

Project

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

4-7

Title

Alternative B,
Other Greater Sage-Grouse Habitat
Impact Analysis Area

indirect disturbance to this lek when compared with Alternative A, and would increase the likelihood of this lek remaining active during mining operations.

Under Alternative B, Colowyo would schedule construction of the sediment retention and erosion control structures outside the lekking and early brood-rearing seasons (March 15 to July 25) in order to reduce potential indirect impacts on GRSG. Colowyo would also manage construction and development of the redesigned temporary overburden stockpile, to the extent operationally feasible, so as to minimize activities on that portion of the stockpile closest to lek SG4 during the brooding season. These actions would contribute to reducing indirect impacts on GRSG.

In addition to relocating disturbance away from lek SG4, Colowyo would donate 4,54*0* acres of land in five parcels to CPW for the preservation of GRSG habitat in perpetuity and enhanced management of GRSG in the Axial Basin. This would result in a minor to moderate, beneficial long-term impact on GRSG. The parcels are located between 1.9 and 7 miles north of the Project Area (**Figure 2-4**). All of the donated parcels are located within mapped GRSG PHMA. The amount of land donated was based on the amount of direct and indirect disturbance to PHMA under Alternative B (**Table 4.9-2**). A distance of 900 meters from the surface disturbance boundary was used to determine the indirect impact area to GRSG and is based on CPW telemetry data *that has been collected over several years in the Axial Basin in proximity to the existing Colowyo mining operations* that shows GRSG typically remain this distance from mining operations. After mining has ceased and the area is reclaimed to pre-disturbance *topography, with a focus on reclaiming to improve GRSG habitat*, there would be a net increase in the amount of PHMA *protected* for GRSG in the region, thereby resulting in a*n overall long term* beneficial impact to GRSG *as a result of the Collom expansion*.

The donated parcels occur in similar habitat to what would be disturbed by mining and mining related activities. Approximately 93 percent (4,203 acres) of the parcels are classified as sagebrush *habitat* and approximately 5 percent (238 acres) are grasslands. The remain*ing two percent* are other shrublands, juniper, or disturbed *habitat*. The primary land use in these areas is livestock grazing.

The donated parcels are known to include at least one active and one inactive GRSG lek. Without the donation of these lands, decisions by Colowyo or future owners could result in changes in surface use, such as for agriculture or real estate development, which would potentially result in adverse impacts on the leks and GRSG. Colowyo would also transfer the BLM grazing preference associated with these parcels to CPW. Permanent donation of the lands containing those leks to CPW would protect the leks from all future potential adverse land use impacts and improve the sustainability of GRSG in the Axial Basin.

The purpose of donating the five parcels and the transfer of the grazing preference to CPW would be to offset the amount of PHMA that would be both directly and indirectly disturbed under Alternative B. The intent of the donation is to provide a greater than 1:1 ratio of GRSG habitat protected in perpetuity to habitat disturbed. Protection of those areas would provide permanent habitat protection for this species in the Axial Basin. *This measure proposed under*

Alternative B is in accordance with the guidelines put forth by USFWS for GRSG (USFWS 2014) as described below:

1. Observe an appropriate mitigation sequence. The redesign of proposed mining operations under Alternative B would avoid and minimize potential impacts to GRSG in the area at the outset of the Project. Minimizing operations on the redesigned temporary overburden stockpile during lekking and early brood-rearing seasons to the extent feasible would help reduce potential indirect impacts to GSG during mining. Successful completion of reclamation under the state approved Reclamation Plan would create new GRSG PHMA where it currently does not exist and increase the total areal extent of PPH in the Axial Basin. Donation of 4,543 acres of PHMA to CPW would ensure that habitat could be protected and managed in perpetuity for the benefit of GRSG.

2. Attain net conservation gain. Colowyo would donate a greater amount of acreage to CPW for the conservation of GRSG than would be directly and indirectly disturbed. Additionally, after successful reclamation under Colowyo's existing, CDRMS approved Reclamation Plan, there would be a net increase of GRSG PHMA habitat in the Axial Basin.

3. Use a landscape-scale approach to inform mitigation. The mitigation proposed under Alternative B would be in accordance with the proposed Northwest Colorado Greater Sage Grouse Draft RMP Amendment and EIS.

4. Ensure transparency, consistency, and participation. The mitigation under Alternative B was developed collaboratively with USFWS, CPW, BLM, OSMRE, and Colowyo.

5. Base mitigation decisions in science. Regional GRSG data was collected through telemetry and other methods in the Axial Basin by CPW and analyzed in research studies over several years. In addition, Colowyo has been working collaboratively with CPW over a number of years to permit CPW to collect local GRSG data within the SMCRA permit boundary on Colowyo owned lands through telemetry and other scientific methods. The Axial Basin GRSG population is the most studied GRSG population in Colorado (B. Holmes, CPW, personal communication February 25, 2014). Both regional and local scientific data and studies were used in developing the mitigation measures.

Along with the donation of the 4,54*0* acres in five parcels to CPW, Colowyo would relinquish the grazing and mineral rights in these areas to CPW. Additionally, Colowyo would relinquish the water rights it holds for any stock watering facilities on those parcels. CPW would then be able to control and manage grazing on the donated parcels with goals of protecting and benefiting GRSG. Relinquishment of Colowyo's mineral rights in those parcels to CPW would reduce the potential for future impacts on GRSG from energy and mineral exploration and development on those parcels. CPW acquisition of the grazing preference, stock water structure, and Colowyo's mineral rights in the 4,543 acres of donated land would substantially strengthen their ability to control land uses and users and manage the donated lands specifically for the protection of GRSG and its habitat in perpetuity. This would result in reduced impacts on the Axial Basin's GSG population and PHMA.

The land donation would occur and CPW would assume ownership of the donation parcels if PR04 is approved by CDRMS and all periods for administrative and judicial reviews and appeals have expired.

Finally, CPW would conduct a GRSG monitoring program near the Project Area to determine the impacts on GRSG from the initiation of coal mining in an area that previously has had few impacts from land disturbance. The results of such a scientific monitoring program would assist in developing effective GRSG mitigation measures that would be applied to similar future mining operations, and thereby contribute to reducing future potential impacts on GRSG. Colowyo would donate $150,000 to CPW to fund the monitoring program. CPW would be responsible for determining and controlling the nature and extent of the monitoring program, the scientific methodologies used, as well as how the donated funds would be expended. This program would have a minor to moderate, beneficial long-term impact on GRSG.

Scientific data on GRSG movement within the SMCRA permit area, and specifically within the Project Area has been collected by CPW over a number of years in cooperation with Colowyo. This data has established a baseline of GRSG behavior prior to any surface disturbance. While much of the literature for GRSG has studied impacts from other types of disturbance more extensively (e.g., oil and gas development), information on the impacts from the development of a coal mine on GRSG is scarce. CPW's monitoring program would fill this gap in GRSG knowledge.

With the increased distance from lek SG4 to the edge of proposed disturbance, the shortened life of the Project, and the inclusion of the additional design features, the impacts to GRSG under this alternative would be *long term* minor to moderate and would be substantially less than under Alternative A.

<u>Columbian Sharp-tailed Grouse</u>

Impacts to Columbian sharp-tailed grouse would be similar to those under Alternative A. However, with the elimination of the Little Collom X Pit and the redesign of the Collom Lite Pit and temporary overburden stockpile, there would be an increase of 546.2 acres of disturbance to a total of 2,636.7 acres. This alternative would directly disturb 2,316.4 acres of winter habitat and 1,563.7 acres of production habitat. This is an increase of 428 acres of disturbance to winter habitat and 318.8 acres of disturbance to production habitat when compared to Alternative A. It is anticipated that this increase in disturbance would still result in *long term* minor impacts to this species due to the large amount of similar habitat outside the Project Area.

In addition to the increase of disturbance to habitat, the redesign of the temporary overburden stockpile would directly remove three of the leks in the Project Area. Leks STLek 1 and STLek 2 were inactive and lek STLek 1a was active in 2011. Lek STLek 1a accounted for 12 of the 139 (8.6 percent) males that were counted during the 2011 monitoring season. While the individuals that would normally use these leks would be displaced *in the long term*, this impact would be relatively minor as there are other leks available in the area.

4.9.3 Alternative C (No Action)

Under Alternative C, there would be no disturbance to the Project Area. Therefore, there would be no impacts to the special status *or sensitive* species that may occur there. *Additionally, as the Craig Station would continue to receive coal for combustion from other mines, any current impacts to special status species from the subsequent deposition of mercury and selenium would continue at or near current levels. Any variation in the amounts deposited would be dependent on the quality of the coal combusted since the quantity of coal combusted would remain constant.*

4.9.4 Mitigation Measures

No mitigation measures would be necessary for special status species.

4.10 CULTURAL AND HISTORIC RESOURCES

The Area of Potential Effect (APE) for cultural resources includes the entire SMCRA permit boundary, which covers the area outside of the direct footprint area of the Collom Lite and Little Collom X pits. This also includes all associated mine-related facilities including the Little Collom sump and the haul road to the load out facility. This APE ensures coverage of all areas of proposed disturbance within the permit boundary and provides a large buffer zone around the disturbance areas to encompass potential indirect and cumulative effects (**Figure 2-1**).

NRHP-eligible (i.e., historic properties) or "needs data" cultural resource sites 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.

Table 4-10.1 summarizes the eligible and "needs data" sites within the APE (i.e., permitted mine boundary). The *Cultural Resource Protection Plan for the Collom Mine Expansion* (SHPO 2013), as required under approved PR03, presents the protocol and protection measures for cultural resources within the permitted mine boundary (**Appendix D**).

Table 4.10-1 NRHP-Eligible and "Need Data" Cultural Resource Sites within the APE

Site Number	Site Type	Cultural Affiliation	NRHP Evaluation	Within area of proposed disturbance?
5MF969	Bison kill site	Prehistoric	Eligible	Adjacent
5MF1652	Open camp	Prehistoric	Needs Data	Outside
5MF3996	Open camp	Prehistoric	Eligible	Outside
5MF4003	Open camp	Prehistoric	Needs Data	Adjacent
5MF4006	Cairn	Unknown	Needs Data	Outside
5MF4008	Homestead	Historic	Eligible	Outside
5MF4010	Lithic scatter	Prehistoric	Needs Data	Outside
5MF5417	Cairn	Prehistoric	Needs Data	Outside
5MF5418	Cairn	Prehistoric	Needs Data	Outside
5MF5419	Cairn	Prehistoric	Needs Data	Outside
5MF6098	Open camp	Prehistoric	Needs Data	Outside
5MF6116	Cairn	Prehistoric	Needs Data	Outside
5MF6128	Homestead	Historic	Eligible	Outside
5MF6130	Lithic scatter	Prehistoric	Needs Data	Outside

4.10.1 Alternative A (Proposed Action)

Of the 14 NRHP-eligible or "needs data" sites within the APE, none would be directly impacted by Alternative A. However, sites 5MF969 and 5MF4003 are adjacent to areas of proposed disturbance. Any impacts to these sites would constitute an adverse *(long-term)* effect. If future mining operations cannot avoid NRHP-eligible site 5MF969, a mitigation plan would be written, approved by BLM in consultation with SHPO, and implemented prior to planned mining activities. Further, a formal testing and data recovery plan (TRC Mariah 2006b) was completed that details the implementation of the excavations and report of findings for needs data site 5MF4003 if it cannot be avoided. The plan is part of the approved PR03.

Archaeological sites are important for their potential to yield information providing a better understanding of prehistory; therefore, NRHP-eligible archaeological sites that cannot be avoided by the Project would be mitigated through conducting excavations intended to retrieve archaeological material and associated information. Reports would then be produced that summarize the excavations conducted at a site, interpret the activities performed on the site, and explain how investigation of the site has contributed to a better understanding of prehistory.

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 currently proposed. If any of these sites cannot be avoided, a testing program would be initiated to determine their NRHP eligibility.

With implementation of the Cultural Resource Protection Plan stipulations, approved by the Colorado SHPO (**Appendix D**), there would be no adverse effect to cultural resources.

4.10.2 Alternative B (Reduced Mining)

Impacts would be similar to Alternative A. Of the 14 NRHP-eligible or "needs data" sites within the APE, none would be within the Alternative B disturbance area. Similarly, sites 5MF969 and 5MF4003 are adjacent to areas of proposed disturbance. Any impacts to these sites would constitute an adverse *(long-term)* effect. If future mining operations cannot avoid NRHP-eligible site 5MF969, a mitigation plan would be written, approved by BLM in consultation with SHPO, and implemented prior to planned mining activities. Further, a formal testing and data recovery plan (TRC Mariah 2006b) was completed and is part of approved PR03 that details the implementation of the excavations and report of findings for needs data site 5MF4003 if it that cannot be avoided.

4.10.3 Alternative C (No Action)

Under Alternative C, there would be no surface disturbance and therefore no impacts to cultural resources.

4.10.4 Mitigation Measures

No mitigation measures would be necessary for cultural resources.

4.11 AMERICAN INDIAN CONCERNS

4.11.1 Alternative A (Proposed Action)

A letter describing the proposed Project was sent to the Eastern Shoshone Tribal Council, Ute Mountain Ute Tribal Council, Ute Indian Tribe Tribal Council, and the Southern Ute Tribal Council on September 26, 2013. An additional consultation letter was sent on January 15, 2015. No concerns were raised regarding any specific religious site, sacred site, or traditional cultural property. No impacts to American Indian concerns have been identified related to Alternative A.

4.11.2 Alternative B (Reduced Mining)

As noted above, letters describing the proposed Project including Alternative B 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 September 26, 2013 and January 15, 2015. No concerns were raised regarding any specific religious site, sacred site, or traditional cultural property. No impacts to American Indian concerns have been identified related to Alternative B.

4.11.3 Alternative C (No Action)

Under Alternative C, no disturbance within the Project Area would occur. Therefore there would be no impacts to American Indian concerns.

4.11.4 Mitigation Measures

No mitigation measures would be necessary for American Indian concerns.

4.12 SOCIOECONOMICS

4.12.1 Alternative A (Proposed Action)

Under Alternative A, mining may continue with the same number of personnel (238), mining rate, and equipment as is currently being used for the existing mining operation. Therefore, the current social and economic conditions in the area would continue for an additional 19 years under this scenario. No additional demand for housing or municipal services would be anticipated. Mining operations would be extended throughout the life of the Project. The extension of mining operations would also extend the annual payroll, local expenditures, and taxes and royalty payments of approximately $35 million per year to the area for an additional 19 years, which would be a *long-term,* moderate to major impact on the economics of the area. The direct economic benefits associated with mining at the Colowyo Coal Mine would continue. 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 Mine coal, has an indirect effect on the socioeconomics of the area by also contributing wages, insurance, taxes, retail spending, housing requirements, etc.

However, under Alternative A, the mining production rate could reach a maximum approved rate of 5.1 mtpy, more than double the current production rate. At this maximum production rate, 55 to 105 additional personnel would need to be employed and additional equipment operated. This would increase demand for housing and services in the area and improve the economic conditions in the area. Annual payroll, local expenditures, taxes and royalty payments would increase and the direct economic benefits associated with mining at the Colowyo Coal Mine would increase.

These effects would be moderate to major, *long*-term, beneficial impacts on socioeconomics for an additional 19 years. 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 the Colowyo Coal Mine 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 Coal Mine operations have ceased, federal coal lease royalty payments would not be collected from Colowyo and 49 percent of those funds would not be dispersed to the State of Colorado and the affected counties (*long-term,* negligible impact on Colorado, minor to moderate long-term impact on the affected counties). The State of Colorado would not collect severance taxes from Colowyo (a loss of 0.5% of the total 2014 Colorado severance revenue; a *long-term,* negligible impact).

4.12.2 Alternative B (Reduced Mining)

Under this alternative, impacts to the social and economic conditions would be similar to Alternative A. However, under this alternative, the Little Collom X Pit would not be mined and this would shorten the life of the mine by approximately four years. This would result in $140 million less revenue being collected in annual payroll, local expenditures, and taxes and royalty payments as compared to Alternative A.

4.12.3 Alternative C (No Action)

Under Alternative C, no new mining would occur at the Colowyo Coal Mine and active mining would cease in four years. Mining of coal at the existing pits would continue until the available coal reserves are depleted (approximately 2019). Approximately 220 direct jobs and associated salaries would be lost if no additional mining takes place. The housing market in Craig and Meeker would decline as many of the current Colowyo Coal Mine 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. Finally, with no additional mining, there would be no royalties paid to the federal, state, and local governments and decreased funding to local governments from the State Department of Local Affairs for infrastructure maintenance and development.

4.12.4 Mitigation Measures

No mitigation measures would be necessary for socioeconomics.

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 blocks views of the Project Area or because the Project Area is at a higher elevation than viewers. Viewers at a higher elevation than the mine, such as from an airplane or recreating in the surrounding area, would generally not observe dust due to the dust mitigation measures employed at the mine. Dust may be visible from higher elevations during high wind events, but this would be relatively infrequent and of short duration.

Viewers on 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)

Views from Moffat County Roads 17, 32, and 133 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 only intermittently 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 a temporary overburden stockpile and four temporary topsoil stockpiles that would be created over time. At maximum height under Alternative A, the temporary overburden stockpile would be 7,675 feet amsl. The four temporary topsoil stockpiles would range from approximately 7,050 to 7,425 feet amsl.

A viewshed analysis was conducted to determine the visibility of the temporary overburden and topsoil stockpiles under Alternative A (**Section 4.13.1.1** and **Section 4.13.1.2**).

4.13.1.1 Short-term Visual Impacts

Viewers traveling on Moffat County Road 32 would have brief intermittent views of the temporary stockpiles just north of the Project Area, 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 stockpiles. Views of the temporary stockpiles would be a 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 stockpiles, 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 stockpiles are visible would be lessened, but intermittent. Frequent travelers along these routes may notice changes in the landscape as the stockpiles 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. At night, the mine lighting would generally appear the same, and from the same locations, as it does currently; there would not be any change apparent to viewers of night skies.

4.13.1.2 Reclamation and *Long-term* Visual Impacts

During the reclamation process, the material in the temporary overburden stockpile would be used to backfill the pits over a several year period. Similarly, the material in the temporary topsoil stockpiles would be used over a several year period as cover material during reclamation. Over that time, the stockpiles would be gradually reduced in size and existing impacts to visual resources from the visibility of the stockpiles would be gradually reduced until the temporary stockpiles are no longer visible. Frequent travelers on the routes that are accustomed to seeing the stockpiles may notice the change in the landscape as they decrease in size and it may attract attention, as would ongoing dust generated by ground-disturbing activities associated with reclamation. Transient travelers may find the visible disturbance and dust noticeable. Upon completion of reclamation, hunters or recreationists in close proximity to the reclaimed mine *might notice a different ecosystem than adjacent non-mined areas, but the overall resource would be returned to the pre-mine condition as required by the reclamation plan. Once reclamation is completed to the requirements of the reclamation plan,* the overall *long term* impact to visual resources would be minor and *the area would* meet Class IV objectives.

4.13.2 Alternative B (Reduced Mining)

Under Alternative B, the impacts to visual resources would be generally similar to those under Alternative A. However, there would be two less temporary topsoil stockpiles. The two remaining stockpiles would have greater overall maximum heights (7,185 and 8,135 feet amsl), but would still have the same visibility as that described for Alternative A. Also, the elimination of the Little Collom X Pit and the redesign of the Collom Lite Pit would increase the disturbance footprint to 2,636.7 acres, an increase of 546.2 acres. The redesign of the Collom Lite Pit would not be visible from any public roadway. Therefore, there would not be any additional impacts from this alternative. Finally, the life of the Project without the Little Collom X Pit would be reduced by approximately four years, thereby restoring the areas to their pre-disturbance character four years sooner than for Alternative A. Alternative B would also be in compliance with the BLM's VRM objectives for Class IV areas. At night, the mine lighting would generally appear the same, and from the same locations, as it does currently; there would not be any change apparent to viewers of night skies.

4.13.3 Alternative C (No Action)

Under Alternative C, no surface disturbance would occur in the Project Area, and there would be no impacts to visual resources in the Project Area.

4.13.4 Mitigation Measures

No mitigation measures would be necessary for visual resources.

4.14 RECREATION

4.14.1 Alternative A (Proposed Action)

Camping, OHV use, touring, bird watching, hiking, and other recreational pursuits would not be allowed in the Project Area due to safety concerns and conflicts with mining operations. Under Alternative A, hunting opportunities would likely decrease due to the increase in disturbance of approximately 2,090.5 acres within the Project Area. Hunting in these areas would be discontinued for the safety of the employees and recreationists. This would be a long-term minor impact. Additionally, hunting success in areas adjacent to the Project Area may decrease in the short-term as big game animals are displaced. However, this impact would likely be negligible as big game animals have become accustomed to mining activities in other portions of the mine 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 pre-disturbance topography, and vegetation and hunting levels would likely return to existing levels. Recreation would be allowed on public lands within the Project Area, but private land would remain closed to the public. Impacts to recreation would be long-term but minor given the overall amount of land available for recreational pursuits outside of the Project Area.

4.14.2 Alternative B (Reduced Mining)

Impacts to recreational opportunities under Alternative B would be similar to Alternative A. However, with the elimination of the Little Collom X Pit and the redesign of the Collom Lite Pit, there would be an increase of 546.2 acres of disturbance under this alternative. This increase in disturbance would result in greater displacement of big game species and less area remaining open to hunting. However, Colowyo would donate 4,543 acres to CPW for GRSG mitigation, which could be used for recreation and hunting. This would result in a beneficial effect on recreation and hunting availability. The elimination of the Little Collom X Pit would reduce the life of the Project by approximately four years; therefore, the Project Area would be reclaimed to its pre-disturbance condition four years earlier. Impacts to recreation would be long term but minor given the overall amount of land available for recreational pursuits outside of the Project Area.

4.14.3 Alternative C (No Action)

Under Alternative C, no surface disturbance would occur in the Project Area, and there would be no impacts to recreational opportunities.

4.14.4 Mitigation Measures

No mitigation measures would be necessary for recreation.

4.15 PALEONTOLOGY

4.15.1 Alternative A (Proposed Action)

Under Alternative A, a total of 2,090.5 acres would be disturbed. As the Project Area lies within a PFYC Class 5 zone, there is a potential that the ground disturbing activities would adversely affect fossils. However, disturbance to potential paleontological resources would only occur where disturbance would occur below the surface (i.e., pits and facilities). Therefore, the total acreage of disturbance that may impact fossils would be approximately 1,203.1 acres. If any such fossils of paleontological interest are located, ground disturbing 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. The potential for discovery of fossils would be greatest in the pit areas were digging would occur to a greater depth. 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 removed prior to or during mining operations would be permanently lost. No such incidents within the existing Colowyo Coal Mine have occurred. Impacts to paleontological resources are anticipated to be none to minor and long term.

4.15.2 Alternative B (Reduced Mining)

Impacts to paleontological resources under Alternative B would be similar to those under the Alternative A. Under this alternative, there would a total of 2,636.7 acres of total disturbance, an increase of 26.1 percent over the Proposed Action. However, under this alternative the Little Collom X pit would not be mined. Therefore, only 990 acres of below surface disturbance would have the potential to damage fossils, a decrease of 17.7 percent from the Proposed Action. Impacts to paleontological resources are anticipated to be none to minor and long term.

4.15.3 Alternative C (No Action)

Under Alternative C, no ground disturbing activities would take place. Therefore, there would be no impacts to paleontological resources.

4.15.4 Mitigation Measures

No mitigation measures would be necessary for paleontological resources.

4.16 ACCESS AND TRANSPORTATION

4.16.1 Alternative A (Proposed Action)

Under Alternative A, a new 5.5 mile haul road would be constructed from the proposed pits and mine facilities within the Project Area to the existing Gossard (rail line) load out. This new haul road would carry all mining related traffic. It is anticipated that the majority of all new traffic would occur within the Project Area and revised mine boundary. 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.

No haul truck would travel on public roadways outside of the SMCRA permit boundary with one exception. Where the haul road crosses County Road 51 in the permit boundary, haul trucks would be on a public road for a short period. Otherwise, only mine pickup trucks, SUVs, etc. would travel on public roads. All coal is removed from the mine via trains.

If the current mining production rate of 2.1 mtpy continues under Alternative A then no additional personnel are anticipated to be employed by the Colowyo Coal Mine. Workers at the currently active South Taylor Pit would transition over to the Collom Lite Pit as the current 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 impacts to public roads are therefore anticipated.

However, under Alternative A the mining production rate could reach a maximum CDRMS approved rate of 5.1 mtpy, more than double the current production rate. At this maximum production rate, 55 to 105 additional personnel would need to be employed and additional equipment would need to be operated. At the maximum production rate, there would be an increase in the overall traffic both within the mine boundary and on public roads outside the mine boundary. However, considering the fluctuating use levels of those roads due to seasonal variations from hunting and tourism, the potential additional impacts to public safety and road maintenance would be minor and short term.

4.16.2 Alternative B (Reduced Mining)

Impacts to access and transportation under this alternative would be similar to Alternative A. No additional traffic is anticipated to occur as there would be no increase in personnel or vehicles used. Additionally, the elimination of the Little Collom X Pit under this alternative would reduce the life of the mine by four years. Therefore, traffic on public roads would be reduced four years sooner than under Alternative A.

4.16.3 Alternative C (No Action)

Under Alternative C, mining would not occur in the Project Area and mining at Colowyo Coal Mine would cease by about 2019. 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)

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 (Reduced Mining)

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 **4.5.1**.

4.17.3 Alternative C (No Action)

Under Alternative C, no mining would occur in the Project Area and there would be no impacts from solid or hazardous wastes.

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)

Under Alternative A, noise would increase in areas where noise has generally been lacking in the western portion of the mine permit boundary. The construction, drilling operations (including blasting), and vehicle use would increase noise levels over historically low levels. These impacts would occur on a 24-hour basis as mining activity occurs throughout the day. However, Alternative A would not increase the overall level of mining activity within the mine boundary if it remained at the current production levels. Instead, it would relocate where the noise is produced. The Project Area is located approximately three miles west of the current mining operations. There would likely be some increase of noise overall during the period when mining is transitioned to the new pits. This impact is anticipated to occur over a five to seven year period. Therefore, there would be a slight increase in the overall area affected by mining noise, but this would be a *short-term*, minor impact until mining would be fully transitioned to the new area and overall noise levels at the mine return to current conditions.

If the mining rate increased to a maximum of 5.1 mtpy, there would be a minor increase in noise from blasting activities *(short term)* and from vehicles *(long term)*. However, the noise generated would occur in the same general location. If the rate of production increases, the number of trains per year required to transport coal would increase (see **Section 2.3.13**). The increase in number of trains would increase noise produced along the rail line.

While no homes occur within the Colowyo permit area, several homes are located just outside the boundary, which would experience *long-term,* negligible to minor noise effects *as described above*. The nearest homes occur approximately 1.6 to 2.8 miles from the proposed disturbance area to the south and southeast. Given the topography and vegetation between the disturbance areas and these homes, it is likely that most noise would attenuate before reaching these residences. Additionally, the homes nearest to the Project Area are approximately 1.2 miles (0.4 mile closer) from current mining operations at the Colowyo Coal Mine. Therefore, once mining is transitioned to the new pits, there would be less noise noticed at these homes.

4.18.2 Alternative B (Reduced Mining)

Under this alternative, the Little Collom X Pit would not be mined. This would eliminate noise from mining activities occurring in that proposed pit area. However, the intensity of mining operations would not change within the mine boundary but would be focused in the Collom Lite Pit area. The elimination of the Little Collom X Pit would reduce the life of the mine by four years, thereby reducing the overall amount of noise produced by the mine throughout the life of the Project. Additionally, the elimination of the Little Collom X Pit and redesign of the temporary overburden pile would move noise disturbance away from the mine permit boundary. This would decrease the potential for noise to affect the public outside the mine boundary to a *long-term* negligible effect.

4.18.3 Alternative C (No Action)

Under Alternative C, no new mining would occur in the Project Area and there would be no impacts from noise.

4.18.4 Mitigation Measures

No mitigation measures would be necessary for noise.

4.19 LIVESTOCK GRAZING

4.19.1 Alternative A (Proposed Action)

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, the AUMS available in the Colowyo Common Allotment would be reduced from 520 to 452 AUMs; a 13 percent reduction. This would be a minor, long-term impact on the availability of grazing on the Colowyo Common Allotment. 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. Therefore, there would be a *long-term* negligible impact remaining to the Colowyo Common Allotment post-reclamation.

4.19.2 Alternative B (Reduced Mining)

Under Alternative B, the impact to livestock grazing would be similar to that under Alternative A. However, as the projected life of the mine would end approximately four years sooner than under Alternative A, grazing would be allowed to resume in the area four years earlier.

4.19.3 Alternative C (No Action)

Under Alternative C, there would be no ground disturbing activity and grazing would be allowed to continue at current levels.

4.19.4 Mitigation Measures

No mitigation measures would be necessary for livestock grazing.

4.20 SOILS

4.20.1 Alternative A (Proposed Action)

Under Alternative A, there would be minor, *long-term* impacts to soil resources including erosion and fertility losses as a result of mining and reclamation activities. Direct impacts would occur on approximately 2,090.5 acres (**Table 4.20-1**). Topsoil would be removed from the mining area and used to rehabilitate existing disturbed sites or stockpiled for future need in accordance with federal and state regulations. Areas where topsoil would be removed include facility areas, access roads, mining pits, and other areas to be disturbed. Colowyo does not plan to use overburden material for topsoil substitutes or to supplement topsoil.

Salvaged topsoil would be stockpiled for later use to reclaim disturbed sites. Stockpiled topsoil would be placed in five locations on stable sites and protected from compaction, wind and water erosion, and contaminants. Topsoil stockpiles would 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.

Topsoil used during the reclamation process would follow the methods outlined in the approved Reclamation Plan under PR03 (Colowyo 2011).

Across the Project Area, impacts to soils may occur from accidental spills or leaks of petroleum products and hazardous materials used during construction, mining activities, and long-term operation of the mine. These events would cause soil contamination and may decrease the soil fertility and revegetation potential. The SPCC plan would reduce the frequency and impacts related to these events to a negligible effect.

4.20.2 Alternative B (Reduced Mining)

Impacts to soil resources under Alternative B would be similar to those under Alternative A. Under this alternative, there would be a total of 2,636.7 acres disturbed (**Table 4.20-1**), so the effects to soils described for Alternative B would occur on 546.2 more acres than Alternative A; the severity of effect would be the same.

Reclamation and soil stockpiling would occur in the same manner under Alternative B as under Alternative A.

Table 4.20-1 Disturbance to Common Soil Types in the Project Area

Soil Unit	Alternative A Disturbance (Acres)	Alternative B Disturbance (Acres)
Campspass fine sandy loam, 3 to 12 percent slopes	22.3	84.5
Cochetopa loam, 12 to 25 percent slopes	14.9	41.5
Lamphie-Jerry Complex, 25 to 65 percent slopes	16.6	65.3
Maudlin-Duffymont complex, 3 to 15 percent slopes, very stony	1,125.3	1,387.1
Morapos loam, 3 to 12 percent slopes	309.8	102.9
Nortez, cool-Morapos complex, 3 to 12 percent slopes	305.6	471.5
Nortez, cool-Morapos complex, 12 to 25 percent slopes	1.9	6.1
Pinridge loam, 1 to 12 percent slopes	0.2	11.7
Torrioerhents-Rock outcrop, Sandstone complex, 25 to 75 percent slopes	182.5	135.9

4.20.3 Alternative C (No Action)

Under Alternative C, no ground disturbing activities would take place. Therefore, there would be no impact to soil resources.

4.20.4 Mitigation Measures

No mitigation measures would be necessary for soils.

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CHAPTER 5 CUMULATIVE IMPACTS[1]

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.

5.2 PAST AND PRESENT ACTIONS

Past and present actions in the general area include past coal mining, 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 those mines closed. *In 1977, Colowyo initiated its first surface mining operations at the Colowyo Coal Mine with the East Pit, which was a multi-seam operation with eight coal seams. Extraction from the East Pit was terminated in 2006. The Section 16 Pit was opened in 1993, as a single seam pit, and was mined concurrently with the East Pit and the West Pit. The West Pit mining commenced in 1996 and was a multi seam pit similar to the East Pit. Mining ceased in the Section 16 Pit in 2002, and mining continued in the West Pit until 2014.* Active mining is currently occurring at the South Taylor Pit. In 2014, the Colowyo Coal Mine produced approximately 2.48 mt of coal (Mines.findthedata.com 2015) and employed 220 people. Currently there are approximately *3,797* acres of past and present mining disturbance associated with the Colowyo Coal 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 northwest Colorado include three underground mines, the Foidel Creek Mine (also known as the Twentymile Mine) (Routt County), the Peabody Sage Creek Mine (not currently in operation or producing coal; Routt County), and the Deserado Mine (Rio Blanco County). Other active mining operations within 20 miles (32 km) of the Colowyo Coal Mine (**Figure 5-1**) include *five* gravel pits, *13* sand and gravel operations, one limestone operation, and one sandstone pit (CDRMS 2014). In addition to these resources, historically there has also been 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

[1] *Italicized text denotes language inserted either in response to comments received on the EA (see **Appendix E**) or to clarify or update a topic based on new or additional information received. Each place where italicized text appears is denoted by a bar in the left hand margin.*

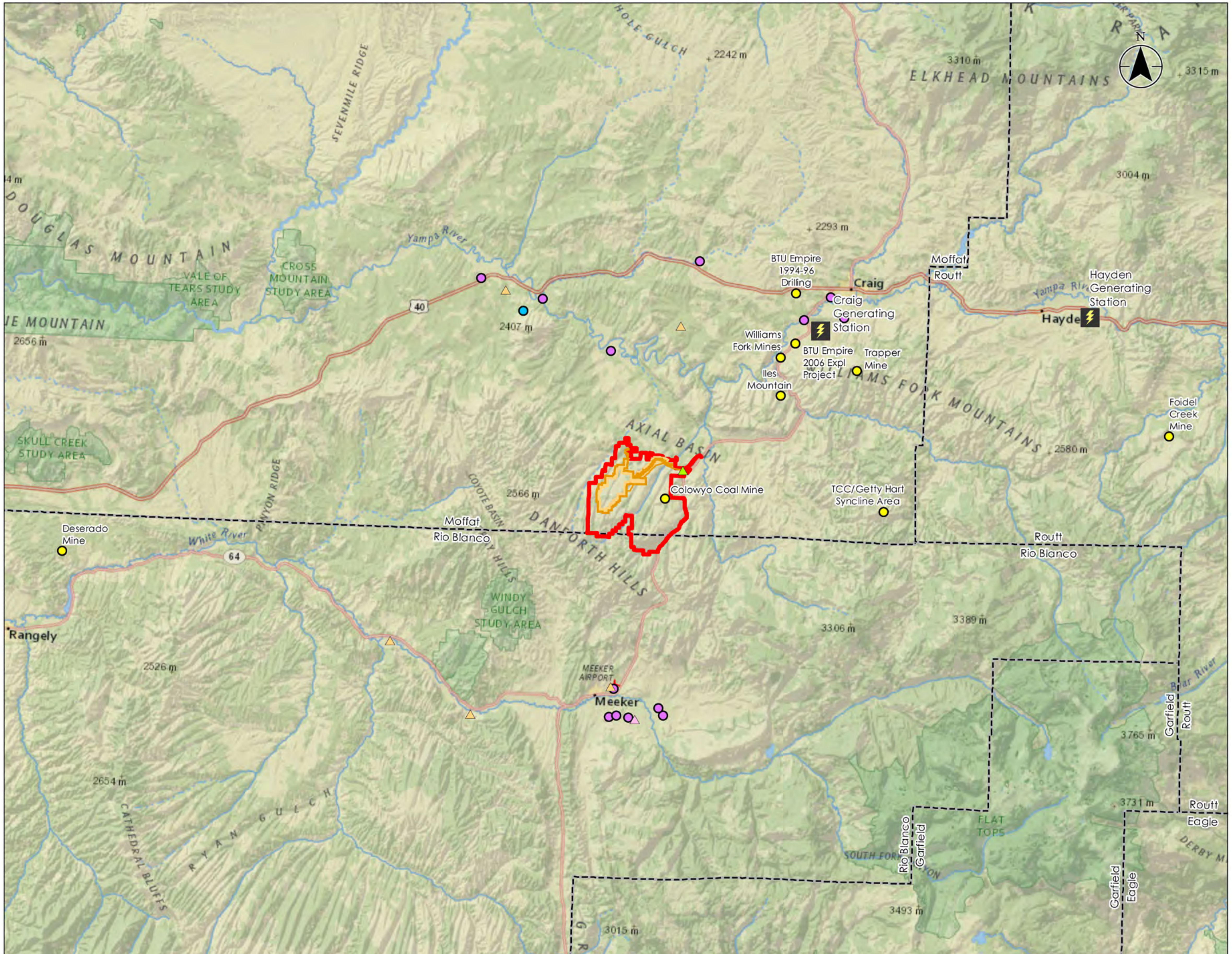
supplemental allocations from nearby reservoirs. The Craig Generating Station receives its coal supply primarily from two sources: Trapper Mine, located 1 mile (1.6 km) south of the plant and the Colowyo Coal Mine located about 30 miles (48.3 km) southwest of the station. The Trapper Mine delivers coal to the plant via 100-ton haul trucks from the mine site. The Colowyo Coal Mine delivers coal to the Craig Generating Station 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 4 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). Ninety people are currently employed at the plant. The Hayden Generating Station receives its coal from the Peabody Coal's Twentymile Mine and occasionally the Colowyo Coal Mine (CDPHE 2015b). Coal is delivered to the station via train (Newcomer and Pierce 2013) and by road.

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 cattle 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. Areas of irrigated agricultural lands are located just east and northeast of the SMCRA permit boundary and State 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 Area, 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 State Highway 13 located immediately east of and running from the northeast to the southwest along the mine's eastern SMCRA permit boundary. This is the main highway connecting Craig with Meeker and Rifle. Moffat County Road 51, a gravel road, traverses the SMCRA permit area from northeast to southwest roughly along the eastern boundary of PR 03. In addition, Moffat County Road 32, also a gravel road, traverses roughly east to west along the northern portion of the SMCRA permit boundary. Various unmaintained dirt roads and two tracks also crisscross the Project Area and vicinity. Use of roads increase noise impacts due to traffic, as well as increase 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



Mine Permits

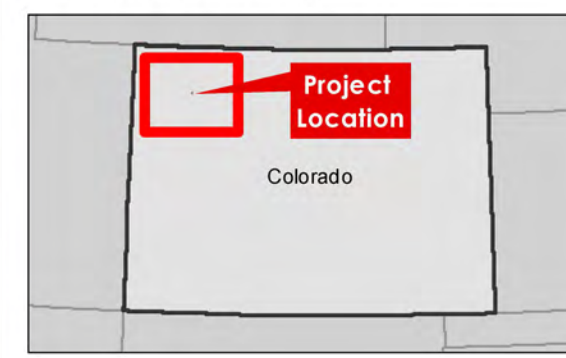
- Coal
- Gravel
- Limestone (general)
- Sand
- Sand and gravel
- Sandstone (silica, stone, quartzite)
- Project Area
- Approved SMCRA Permit Boundary
- Generating Station
- County Boundary

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

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

5-1

Title

CDRMS Active Mine Permits

would have very low mortality impacts on wildlife. State Highway 13, which is a paved high speed road, would contribute higher impact levels for wildlife mortality.

The Colowyo railroad spur connects the Colowyo loadout located at the northeast corner of the SMCRA permit boundary 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 of the Project Area. Electric 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 Colowyo Coal Mine along State 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 Colowyo Coal 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. However, no coal lease by applications have been filed with BLM in the area, and no SMCRA permit application packages have been filed with CDRMS that would be available and allow assessment of the potential effects of future mining. While it could be speculated that mining methods utilized for new mines would be similar to those utilized at the Colowyo and Trapper surface mines and that the effects would also be similar in nature and magnitude, it is also possible that new mining technology may be developed prior to mining these coal resources.

The BLM LSFO is 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. *On January 15, 2016, the Secretary of the Interior issued Secretarial Order (SO) No. 3338, Discretionary Programmatic Environmental Impact Statement to Modernize the Federal Coal Program (DOI 2016). The SO placed a pause on issuing new and pending federal coal leases, including lease modifications, until the DOI undertakes and completes a comprehensive review of the federal coal leasing and management program. However, the Foidel Creek lease modification qualified for an exception to the SO. The Decision Record approving the lease modification was signed by BLM in December 2015 prior* *to the issuance of the SO and the Foidel Creek lease modification was listed in Table 1. Projects Potentially Covered by One of the Pause Exceptions of the SO. That lease modification was issued by BLM on April 11, 2016 and was effective on April 1, 2016.* The Foidel Creek Mine provides coal to the Hayden Generating Station, as well as other facilities throughout the country, and if all the coal from the lease modification were shipped to Hayden, it would provide about 78 days of the power plant's coal needs.

CDRMS is currently processing PR07 for the Trapper Mine (owned by Trapper Mining Inc.) 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 PR06, to continue mining up to 2017 at a production rate of about 2.6 mtpy.

The Deserado Mine, operated by Blue Mountain Energy, Inc., is an underground coal mine located approximately 50.5 miles (81 km) west of the Colowyo Coal Mine. CDRMS has no pending permit actions for this mine. The BLM LSFO has no pending lease modifications or lease by applications for this mine.

The Peabody 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 Coal 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 Generating Stations 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 that would supply the Craig or Hayden Generating Stations with coal have been filed with BLM, 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 GRSG 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 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 Part 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 would be implemented.

5.4.1 Topography

The CIAA for topography is the Project Area. Additional mining at the Colowyo Coal Mine under either Alternative A or B would have short-term effects on topography while mining is active until the reclamation is completed. Within the SMCRA permit boundary, a total of *1,579* acres have been reclaimed previously. General pre-mining topography would be approximated through implementation of the Reclamation Plan approved under PR 03 (**Appendix A**). 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 pre-disturbance contours. *Under* Alternative C (No Action) *mining* would conclude *in approximately 2019* when the available coal reserves are depleted at the existing mine *and reclamation would last through approximately 2029*. 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. The assessment utilized topography to define the likely region of influence; 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 5-2** 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 within the CIAA

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

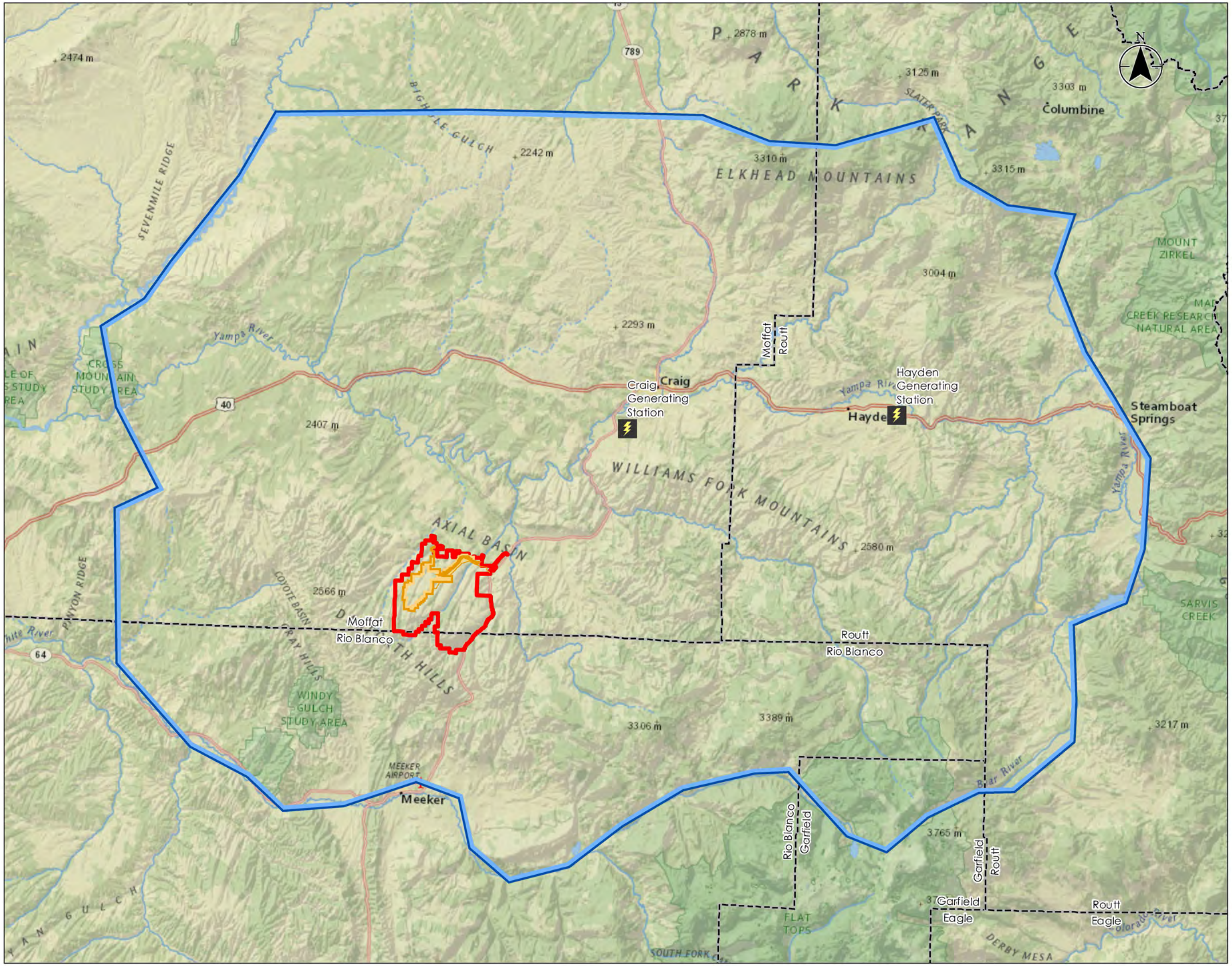
5.4.2.3 2011 National Emissions Inventory Total Regional Emissions

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

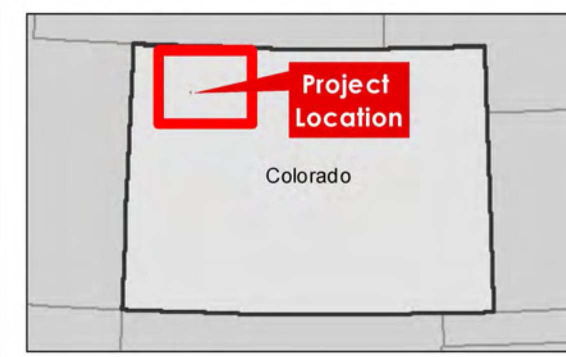
County Boundary

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

Office of Surface Mining Reclamation & Enforcement
Colowyo Coal Mine: Collom Permit Expansion Area
Project Mining Plan Environmental Assessment

Figure No.

5-2

Title

Cumulative Impacts Airshed Boundary

5.4.2.4 Cumulative Emissions (Direct and Indirect)

Cumulative emissions for Alternatives A and B were determined using three regional emission scenarios based on maximum coal production. First, the maximum emission potential based on a coal production level of 5.1 million tons *for Alternative A and 5.0 million tons for Alternative B* between the Craig and Hayden Generating Stations was implemented to conservatively estimate annual criteria pollutants. Second, a regional average of emission potential between the Craig Generating Station and the Hayden Generating Station was calculated to represent a typical regional emission rate. Lastly, because the vast majority of coal from the mine is sent to the Craig Generating Station, a Craig Only emissions scenario was evaluated. Refer to **Table 4.3-23** for explicit emissions details. 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 5.1 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 of total emissions from the Craig and Hayden Generating Stations. It should be noted that 5.1 mtpy equates to unrealistic combustion rates and the corresponding emissions are 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	7,167	765	4,548	24,605	89	2.7
Indirect Rail	0.6	0.6	6.2	7.8	0.3	0.13
Indirect Combustion Maximum	431	196	18,867	1,545	143	6,782
Indirect Combustion Average	324	174	17,008	1,333	111	5,434
Craig Combustion Only	216	152	15,149	1,545	78	4,086
Total Maximum	**7,598**	**961**	**23,421**	**26,157**	**232**	**6,785**
Total Average	**7,491**	**939**	**21,562**	**25,945**	**200**	**5,437**
Total Craig Only	**7,383**	**917**	**19,703**	**26,157**	**167**	**4,089**

Note that Total Maximum is the higher value between the Craig and Hayden Generating Stations. Total Average is the average value between the two sites.

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 5.1 mtpy at the Craig Generating Station is unrealistic in practice; hence the percentage comparison is greater than 100 percent shown below. A large amount of blasting and fugitive emissions (vehicle travel) contribute the vast majority of direct emissions.

Table 5.4-4 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	34.0%	16.5%	53.3%	45.7%	0.18%	101%
Proposed Average % of 4 Counties	33.5%	16.2%	49.0%	45.3%	0.16%	80.6%
Proposed Craig Only % of 4 Counties	33.0%	15.8%	44.8%	45.7%	0.13%	60.6%
Proposed Maximum % of Colorado	2.3%	0.94%	7.7%	1.8%	0.04%	12.2%
Proposed Average % of Colorado	2.3%	0.92%	7.1%	1.8%	0.04%	9.8%
Proposed Craig Only % of Colorado	2.2%	0.90%	6.5%	1.8%	0.03%	7.3%

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 in Chapter 4 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 Alternative A 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 5.1 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	445,885	16.6	6.4	448,203
Indirect Rail Combustion	--	--	--	2,792
Methane Release	--	2,827	--	70,675
Indirect Combustion	11,859,899	1,399	203	11,955,485
Total	**12,305,784**	**4,243**	**209**	**12,477,155**

Table 5.4-6 compares the potential GHG emissions from 5.1 mtpy 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	9.6%
% of United States Total	0.56%

[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	13.4
Indirect Rail	0.02
Indirect Combustion Max	65.47
Indirect Combustion Avg.	54.67
Craig Combustion Only	65.47
Total Maximum	**78.9**
Total Average	**68.1**
Total Craig Only	**78.9**

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	0.040%
Proposed Average % of Colorado	0.035%
Proposed Craig Only % of Colorado	0.040%
Proposed Maximum % of U.S.	0.00087%
Proposed Average % of U.S.	0.00075%
Proposed Craig Only % of U.S.	0.00087%

Estimated mercury emission rates from the Craig Generating Station are calculated based on 5.1 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. The Craig Generating Station had complied with the new standard at all three units in April 2015. Prior to compliance with the MATS rule indirect mercury emissions were estimated at 155 lbs/yr, but after implementation of controls it drops to 62 lbs/yr. Other sources of mercury are negligible (less than 0.01 lbs/yr) when compared to 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 Craig Generating Station's contribution assuming 5.1 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 of the national total.

Alternative B Criteria Pollutant Cumulative Emissions

Alternative B comprises emissions for the mine, Craig Generating Station, and the Hayden Generating Station mining only the Collom Lite Pit. Mining the Little Collom X Pit is excluded. **Tables 5.4-9** outlines the cumulative criteria pollutant emissions for the Collom Lite Pit 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. 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 (tpy)

Activity	PM_{10}	$PM_{2.5}$	NO_x	CO	VOC	SO_2
Direct Emissions[1]	2,779	279	3,388	18,079	64.1	2.0
Indirect Rail	0.3	0.3	6.1	7.7	0.3	0.13
Indirect Combustion Max	*423*	*193*	*18,497*	*1,514*	*140*	*6,649*
Indirect Combustion Avg.	*317*	*171*	*16,675*	*1,306*	*108*	*5,327*
Indirect Craig Combustion	*212*	*149*	*14,852*	*1,514*	*76*	*4,006*
Total Maximum	**3,202**	***471***	***22,891***	**19,600**	***205***	***6,651***
Total Average	**3,096**	***450***	**20,069**	**19,390**	**172**	**5,329**
Total Craig Only	***2,991***	**428**	**18,246**	**19,600**	***140***	**4,008**

[1] Values for direct emissions differ from Alternative A (Table 5.4-3, mainly due to differences in required haul distances.

CO, NO_x, and SO_2 emissions are higher than all other criteria pollutants. This is expected because the indirect combustion emissions dominate the cumulative impacts, while blasting contributes a large percentage of the CO emissions. The percentage contribution of Alternative B compared to the counties surrounding the study area produce a maximum of *49.8* percent of the NO_x emissions; 34.3 percent of CO emissions, and *98.6* percent of SO_2 emissions. It should be noted that the 5*.0* mtpy combustion rate is unrealistic from either Generating Station; thus the *nearly* 100% scenario. Compared to the state, those percentages reduce to 7.2 percent, 1.39 percent, and *11.9* percent, respectively (**Table 5.4-10**).

Table 5.4-10 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	*14.3%*	8.*1*%	*49.8%*	34.3%	0.16%	*98.6%*
Proposed Average % of 4 Counties	13.8%	7.7%	45.6%	33.9%	0.14%	*79.0%*
Proposed Craig Only % of 4 Counties	13.4%	7.4%	*41.5%*	34.3%	0.11%	*59.4%*
Proposed Maximum % of Colorado	0.97%	0.46%	7.2%	1.39%	0.04%	*11.9%*
Proposed Average % of Colorado	0.94%	0.44%	*6.60%*	1.37%	0.03%	9.56%
Proposed Craig Only % of Colorado	0.91%	0.42%	6.00%	1.39%	0.03%	*7.19%*

Alternative B Cumulative GHG Emissions

GHG emission calculations (**Table 5.4-11**) are based on maximum annual mining rates and all coal being sent to the Craig Generating Station.

Table 5.4-11 Cumulative Emissions of Greenhouse Gases (metric tonnes CO_2e/yr)

Activity	CO_2	CH_4	N_2O	CO_2e
Direct Combustion	265,423	10.0	4.9	267,123
Indirect Rail Combustion	--	--	--	2,792
Methane Release	--	*2,772*	--	*69,291*
Indirect Combustion	*11,627,352*	*1,371*	*199*	*11,721,064*
Total	***11,892,775***	***4,153***	***204***	***12,060,215***

Alternative B would contribute a small percentage of overall GHGs to the region and state. Maximums are no greater than 9.*3* percent when compared to the state totals and less than 1 percent of the total GHGs emitted nationwide (**Table 5.4-12**).

Table 5.4-12 GHG Emissions as Percentage of State and National Emissions

Activity	5.*0* mtpy
Total GHG for State of Colorado[1]	130
Nationwide GHG Total[2]	2,245
% of State Total	9.*3*%
% of U.S. Total	0.*54*%

[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 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 5.4-13**).

Table 5.4-13 Cumulative Emissions of Hazardous Air Pollutants (tpy)

Activity	HAPs
Direct Emissions	8.0
Indirect Rail	0.02
Indirect Combustion Max	*64.19*
Indirect Combustion Avg.	*53.60*
Craig Combustion Only	*64.19*
Total Maximum	**72.2**
Total Average	***61.6***
Total Craig Only	**72.2**

Compared to the state (195,455 tpy), Alternative B includes only a maximum of 0.*037* percent of the state HAPs and 0.*00080* percent of the U.S.'s total (**Table 5.4-14**). Therefore, Alternative B would emit an essentially negligible amount of HAPs when compared to the state and the rest of the country.

Table 5.4-14 HAP Emissions as Percentage of State and National Emissions

Percentage Comparison	HAPs
Proposed Maximum % of Colorado	0.*037*%
Proposed Average % of Colorado	0.032%
Proposed Craig Only % of Colorado	0.037%
Proposed Maximum % of U.S.	0.0008*0*%
Proposed Average % of U.S.	0.0006*8*%
Proposed Craig Only % of U.S.	0.0008*0*%

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 became compliant with the MATS rule in April 2015. As a result, the amount has dropped to the annual average of 44 lbs or 0.022 tons/year since 2010. The 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 of the national total.

Ozone Precursor Emissions

Discussion throughout **Chapter 4** describes both NO_x and VOC emissions and their comparison to the development of ozone. In addition, regional CDPHE monitors have demonstrated that Moffat County is in compliance with the ozone NAAQS (**Section 4.3.2.5**). As a result, blasting and coal combustion associated with the Colowyo Coal Mine and either the Hayden or Craig Generating Stations 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.[2]

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).[3]

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.

Criteria Pollutant Results from CARMMS

CARMMS evaluated regional air quality impacts for PM, NO_2, and O_3. **Table 5.4-15** illustrates the average regional impacts compared to the applicable NAAQS. The findings suggest that the regional air quality surrounding the Colowyo Coal Mine and the Craig Generating Station is compliant for those pollutants and averaging periods evaluated. All pollutants assume the 1st high average concentration with the exception of ozone, which is the average 4th high value. Note that all concentrations are the maximum values for each averaging period through the study timeframe of 2021.

[2] Bureau of Land Management - http://www.blm.gov/co/st/en/BLM_Information/nepa/air_quality/carmms.html

[3] 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 5.4-15 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	63.73	70	91.04%

1. O_3 concentrations are in units of ppb

In western sections of Moffat County and Rio Blanco County near Rangely, the projected O_3 levels are above the 70 ppb NAAQS level based on the CARMMS modeling for the "high" development scenario. However, the CARMMS areas of modeled O_3 concentrations above 70 ppb are outside the Colowyo Mine air quality study area boundary. Also, the projected elevated O_3 levels in western sections of Moffat County and Rio Blanco County are likely due to the emissions associated with existing and future oil and gas development in the Uinta Basin of eastern Utah and are not tied to the Colowyo Mine direct and indirect emissions.

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,[4] 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 is determined. 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 Generating 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.[5]

[4] U.S. EPA http://www.epa.gov/ttn/caaa/t1/memoranda/reasonable_progress_guid071307.pdf
[5] Colorado SIP Mount Zirkel Technical Support Document https://www.colorado.gov/pacific/sites/default/files/AP_PO_Mount-Zirkel-Wilderness_0.pdf

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.[6]

The Craig Generating Station has two units that are Best Available Retrofit Technology (BART) eligible (Units 1 and 2). These two units (along with Unit 3) are included in the current Regional Haze SIP. As a result, both are required to meet specific NO_x standards. To help meet applicable standards, Selective Catalytic Reduction (SCR) units are being or will be installed to control NO_x emissions. They have also installed wet lime scrubbers for SO_2 control, which have been 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."[7] 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 U.S. Forest Service concerns.

5.4.2.7 Regional Nitrate and Sulfate Deposition

Secondary aerosols form in the atmosphere from precursors gases (e.g., SO_2, NO_x, 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 within 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 considerably 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

[6] https://www.colorado.gov/pacific/sites/default/files/AP_PO_Flat-Tops-Wilderness_0.pdf
[7] CDPHE Regional Haze SIP Craig Station https://www.colorado.gov/pacific/sites/default/files/AP_PO_Craig-Power-Plant_0.pdf

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/m^3, 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 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. It should be noted that SCRs do have some ammonia emissions (ammonia slip). The rate of ammonia from SCRs is typically 2-10 ppm and not considered to result in plume formation or human health hazards.[8]

5.4.2.8 Alternative C (No Action) Cumulative Effects

Alternative C (No Action) would equate to no development of the Collom Lite or Little Collom X areas. Only the South Taylor Pit would include active mining. All direct mining emissions would decrease as the total amount of coal extracted would not reach 5.1 mtpy. The total amount would be closer to 4.0 mtpy. Indirect railroad emissions may increase somewhat as the rail distance from another mine to the Craig Generating Station could become greater as the South Taylor Pit coal amount decreases.

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, the Craig Generating Station would continue to obtain 2.3 mtpy from the Colowyo Coal Mine, but the amount would steadily decline and be zero following 2019. Alternative C (No Action) would have a lower overall cumulative emissions effect than Alternative A or B, which was discussed in detail above. 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, Alternative C (No Action) 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 removal of coal. Since 1977, Colowyo has mined between 0.3 and 6.4 million tons of coal per year for a total of 150.9 million tons of coal produced. Approximately 81.6 million tons of coal would be mined under Alternative A, or 54 percent of all the previously mined coal at the Colowyo Coal Mine. 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 and oil and gas development. However, while future mining would possibly occur in the CIAA, such mining would not occur until the subject Project

[8] SCR Air Pollution Control fact Sheet: http://www3.epa.gov/ttncatc1/dir1/fscr.pdf

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. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered less than minor to moderate.

5.4.4 Water Resources

The CIAA for water resources includes the Morgan Gulch and Wilson 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 the Morgan Gulch and Wilson Creek watersheds (receiving streams for Project Area drainages) could include existing coal mining operations, oil and gas exploration, and agriculture (primarily grazing).

No other active mines occur within the CIAA for water resources. All coal mining operations in Colorado are regulated by CDRMS to reduce or eliminate potential impacts to water resources in accordance with SMCRA. All coal mining operations must also comply with the CWA and the permits for all coal mines include numerous design features to protect water resources. Therefore the cumulative effects of other coal mining would be negligible.

The Colorado Division of Minerals and Geology (the Division) has also completed a cumulative impact analysis of mining operations approved under PR03 (Alternative A) on the hydrologic balance of the Yampa River Basin. The Division is required by the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining to determine whether proposed coal mining operations are designed to prevent material damage to the hydrologic balance outside the approved SMCRA permit area and assess the probable cumulative impacts to the hydrologic balance from all anticipated coal mining in the general area. Rule 2.05.6(3)(b)(iii) requires that the permit or permit revision applicant estimate the likely hydrologic impacts through an analysis known as the Probable Hydrologic Consequences (PHC)(Rule 2.05.6(3)(b)(iii). The Division is then required by Rule 2.07.6(2)(c) to use this and other hydrologic information to assess the probable cumulative impacts to the hydrologic balance from, not only the permit application, but also all anticipated coal mining in the general area. This latter assessment is known as the Cumulative Hydrologic Impact Assessment (CHIA) (OSM Technical Information, 1991). The CHIA considers "life of mine" impacts and determines whether or not the proposed operation will prevent material damage when considered with all other coal mining activities within the assessment area. The Division prepared the Yampa River CHIA which was last revised in May 2010. The Yampa River CHIA covers all coal mining within the Yampa River Basin which includes 16 mines. A May 1, 2015 internal CDRMS memorandum (CDRMS 2015) states: "…The Division has written 39 findings documents since May 4 2010 that are related to the Yampa CHIA: they are listed in the table below. (Only nine of the 16 mines had findings documents in this time period.) None of these documents indicate that the potential for material damage to the hydrologic balance outside of the permit areas of the mines has significantly increased since the CHIA update in May 4 2010."

Coal is transported from the Colowyo Coal Mine to the Craig Generating Station on an approximately 27 mile long rail line with the unit trains operated by Union Pacific. Approximately 18 miles of the railroad line from the mine towards Craig is owned and maintained by Colowyo. Union Pacific owns and maintains the remainder of the line to the

Craig Station. At the current average production rate of 2.3 mtpy, coal is shipped on approximately 250 unit trains per year. At the proposed maximum production rate of 5.1 mtpy, approximately 554 unit trains per year would be needed to transport the coal to markets.

With rail transport there is the possibility of an accidental derailment of coal cars and spill of coal. The number of historic accidents on the line from the Colowyo Coal Mine to the Craig Station provides a perspective on the general probability of such an accident occurring in the future. According to the accident records of the Federal Railroad Administration (FRA), between 1977 and 2015 (38 years) only one accident involving derailment of a loaded coal car occurred between the Colowyo Coal Mine and the Craig Station in 2003 (FRA 2015). Two derailment accidents occurred on the Craig Station property in August and November of 2006. At the current average production rate of 2.3 mtpy, the 1977-2015 timeframe would represent about 9,500 unit train trips, and at an average of 110 coal cars per unit train, about 1,045,000 individual coal car trips with only one spill accident. Therefore, based on this information, the general possibility of a spill due to accidental derailment would be extremely small.

Even if a spill did occur along the rail route, coal is not classified by EPA as a hazardous material. Coal is naturally occurring in the region and coal beds are exposed at the surface in many areas as well as crossed by river and stream beds directly. The very small amount of additional coal potentially left after cleanup or that would enter stream waters would be a negligible amount compared with the large amount of naturally occurring coal material exposed in the region. The area affected by a spill would be contained within a very localized area adjacent to the rail line. The main impact would be disturbance of the ground beneath the coal cars and the spilled coal. Cleanup of the site would occur expeditiously to prevent interruption in transport of coal from the mine to markets. Given the lack of historic coal car derailment accidents over the past 38 years and the factors described above, the potential cumulative effects would be negligible.

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 negligible 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. 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 cumulative effects would be minor.

In summary, given: 1) the minor impacts to water resources that have occurred as a result of mining in past 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. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, 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 and Alternative B would have the potential to cumulatively impact vegetation in the area. Grazing is anticipated to continue outside of the Project Area as currently practiced, and vegetation communities are not likely to be adversely impacted. Wildlife usage (including GRSG) and vegetation communities are not likely to be adversely impacted outside of the Project Area over the long term. Reclamation activities would actually likely add seral and community diversity and increased production of forage for livestock, fish and wildlife. Along with the past, present, and future actions, mining in the CIAA is likely to result in minor cumulative impacts 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. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.6 Wetlands

The CIAA for wetlands is the Project Area. The cumulative impacts of additional mining to wetlands would arise from the removal of the wetlands within the Project Area and potential sedimentation of downstream wetlands. Given the measures in place and approved in PR 03 to reduce the potential for downstream impacts, these impacts would be minimal. Grazing, if not properly managed, can cause impacts to the structure and water quality of those wetlands. 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. However, sedimentation control design features would be incorporated into road construction to preclude impacts.

The CIAA for WOTUS (excluding wetlands) is the Morgan Gulch and Wilson Creek watersheds. Alternative A and Alternative B would result in the loss of some of the mapped WOTUS in these watersheds. This would cumulatively add to the impacts to WOTUS. 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, Alternative A or Alternative B would have minor cumulative impacts to wetlands and WOTUS, since any impacted wetlands and WOTUS would be subject to mitigation. If any additional wetlands are located or delineated within the Project Area, they may be subject to additional mitigation. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.7 Fish and Wildlife

The CIAA for fish and wildlife resources is the SMCRA permit boundary, which provides a large buffer zone around the disturbance areas.

When combined with past, present, and 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 owned primarily by Colowyo 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 2015c). Participating ranches provide public hunting recreation access to their land free of charge to those who draw licenses. The ranch includes approximately *19,782 acres* owned by Colowyo. Livestock grazing on the ranch is limited to mid-May through mid-October du e to climatic conditions 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 will 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. Any future potential oil and gas development within the permit boundary would occur after mining and reclamation are complete. Outside the permit boundary, oil and gas development may occur on other federal or private lands concurrent with mining. 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 are likely to be negligible.

For fisheries, Alternative A and Alternative B would have the potential to add to the cumulative impacts in the CIAA. 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 the design features in **Appendix B**, the potential for sedimentation would be small. Therefore, the cumulative impacts to fisheries would also be negligible. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* 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 1 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 2 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.

GRSG is a Colorado species of special concern and BLM sensitive species. For GRSG, Colowyo is required to implement their proposed design features for GRSG as approved by CDRMS under PR 03 for Alternative A as contained in **Appendix B**. In addition, Colowyo's approved Reclamation Plan (**Appendix A**) focuses on restoration of the sagebrush steppe vegetative community for the specific benefit of GRSG. This plan would result in a post mining increase in GRSG habitat when compared with the pre-mining condition. The above design features are also in addition to other design features for GRSG that Colowyo is required to implement under their previous permit revisions and the original SMCRA permit for the Colowyo Coal Mine. Further, under Alternative B, Colowyo would be committed to a proposed GRSG mitigation package previously described in **Chapter 2**.

Since the 4,543 acres of PHMA that would be donated by Colowyo under Alternative B would be more than the acreage of PHMA that would potentially be impacted under this alternative, there would be a net increase in the acreage of PHMA protected under Alternative B when compared to the pre-mining condition. Donation of those lands to CPW would also ensure that the PHMA would be preserved, protected, and managed for the benefit of GRSG in perpetuity. With the inclusion of Colowyo's grazing and mineral interests in the donation package, CPW would control management of future grazing in the interest of GRSG habitat and there would be a greater assurance that there would be no future oil and gas or mining development of those lands. Both Alternative A and Alternative B follow the guidelines set forth in the recent GSRG RMP Amendment that looks at the cumulative effects from ground disturbing activities to the GSRG. This amendment sets a cap on disturbance allowed in priority habitat and both alternatives would remain below that cap.

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 the

Colowyo Coal Mine. 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 Mine 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 the Colowyo Coal Mine. 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., Alternative C (No Action)) as coal would be supplied from elsewhere. Overall, cumulative impacts would be minor.

Alternative A or Alternative B, in conjunction with other past, present, and reasonably foreseeable future actions, would contribute negligible to minor long-term cumulative impacts from the 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 impacts from the 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.

Given the combination of design features and reclamation measures that would be implemented, the contribution of the mining in the Project Area would have negligible cumulative impacts. Additionally, in the context of other land uses and processes that are currently occurring or may occur in the future, the cumulative impacts would be lessened by the amount of habitat that would remain available.

5.4.9 Cultural and Historic Resources

The CIAA for cultural resources is the SMCRA permit boundary, 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 livestock 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 cultural resources protection measures described in **Section 2.3.16** and **Appendix D**. 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. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered less than negligible.

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 that there are 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. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* There would be no cumulative impacts under the No Action.

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 and Rio Blanco counties where the Colowyo Coal 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 19 and 15 years, respectively. Cumulatively, the mining in these counties including that which occurs at the Trapper, Foidel Creek, and Deserado mines in conjunction with current mining at the Colowyo Coal 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 a minor to moderate 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 Alternative C (No Action), mining of coal at the existing mines would continue until the available coal reserves are depleted (approximately 2019) and reclamation completed (approximately 2029). The socioeconomic impacts discussed in **Section 4.12** would not happen under Alternative A or B. 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 GRSG habitat (Jaffe 2015). The management of public lands under the direction of the Northwest Colorado Greater Sage Grouse LUP/FEIS (BLM 2015a) 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 2015a). Therefore, the economic impacts under Alternative C (No Action) 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 Environmental Justice

As there are no anticipated impacts to environmental justice populations, there would be no cumulative impacts under either Alternative A or Alternative B.

5.4.13 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. Combined with other ongoing surface disturbing activities, including the current mining operation at the South Taylor Pit, and in the region, (i.e., oil and gas development) implementation of Alternative A or Alternative B would cumulatively contribute to a visually impacted landscape. Mining operations at the South Taylor Pit will reduce and ultimately terminate shortly after completion of the transition of mining to the Collom area and reclamation will continue returning that area to its pre-mining landscape. This would reduce the cumulative impacts of mining over a period of several years. Also, given the topographically screened location of the mine and ancillary facilities, and the fact that these features may not be visible outside of the mine permit area, the cumulative impacts would be negligible.

While the location of the mine and ancillary facilities are topographically screened, visual disturbances associated with the temporary overburden and topsoil stockpiles 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 ongoing South Taylor/Lower Wilson expansion to the Colowyo Coal 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 disturbance areas, and the gradual use of and associated decrease in size of the temporary stockpiles. Alternative B would have potentially greater cumulative impacts as it would disturb a larger footprint than Alternative A. 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. Cumulative impacts under either Alternative A or Alternative B would be negligible to minor. Mining and reclamation under Alternative C (No Action) would conclude sooner than both Alternative A and Alternative B. Consequently, cumulative impacts under the No Action are considered negligible.

5.4.14 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 under Alternative A or Alternative B would be negligible. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.15 Paleontology

The CIAA for paleontological resources is the Project Area. Mining under Alternative A or Alternative B could cumulatively 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 CIAA would be subject to paleontological protection measures. Given the small area disturbed (49 percent of the Project Area, 7 percent of the permit area), 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 under Alternative A or Alternative B would be negligible. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.16 Access and Transportation

The CIAA for access and transportation includes Moffat and Rio Blanco counties. Mining under either Alternative A or Alternative B would maintain mine-related infrastructure for traffic. Although the Jubb Creek access road would be an improved new 5.9 mile (9.5 km) long road into the Project Area, only mine traffic would be allowed on the road and the public would be prohibited from utilizing the road. 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 is not anticipated to vary from current levels. 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, the number of mine employees would likely increase along with traffic volume both inside the mine permit boundary and outside the boundary on county and state roads. Regardless of such an increase in production, the cumulative impacts from the relatively small incremental increase in mine traffic under either alternative would remain negligible. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.17 Solid and Hazardous Waste

The CIAA for solid and hazardous waste is the Project Area. Mining under Alternative A or Alternative B would produce small amounts of hazardous and solid wastes. These wastes would continue to be managed and controlled under current regulations, as well as through Colowyo-initiated solid and hazardous waste handling procedures approved under PR 03 and BMPs. Ongoing oil and gas development has the potential to cumulative add to the amount of solid and hazardous wastes produced in the region. Cumulative impacts would be kept within state and federal standards and would be minor. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered negligible to minor.

5.4.18 Noise

The CIAA for noise is the Project Area and the railroad. The principle noise sources related to additional mining operations include blasting, vehicles, the railroad, and noise from other facilities such as for mine vehicle maintenance. While noise would increase within the Project Area and along the railroad if there is increased production, most of the noise would attenuate before reaching the mine permit boundary. During the transition from the current mining operation at the South Taylor Pit to the Collom area, there would be a temporary increase in overall noise as construction and mine operations in the South Taylor Pit area overlap with those initiated in the Collom area. Once the transition is complete, mine operation related noises would shift from the South Taylor Pit area to the Collom area. Noise levels in the South Taylor Pit area would be substantially reduced over time as reclamation progresses and noise levels at the Collom area would be similar to those which have been ongoing at the South Taylor Pit area (including the East and West pits) for about *38* years. In conjunction with other past, present, and reasonably foreseeable future land uses, the mining under Alternative A or Alternative B would result in negligible cumulative impacts to the region. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are* *depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.19 Livestock

The CIAA for livestock grazing is the five grazing allotments within the permit boundary. Closure of the expanded mine boundary to grazing under both Alternative A and Alternative B would cumulatively add to impacts on livestock grazing in the affected grazing allotments by reducing available forage. However, grazing is one of the post mine land uses targeted by Colowyo's CDRMS approved Reclamation Plan and, upon completion of mining, the mine area would be restored for future livestock grazing. 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 reduction of the available forage in the allotments would likely be minor. The reduction of the available forage in the allotments would be negligible to minor because grazing would again be available after reclamation and successful revegetation. Under Alternative or Alternative B cumulative impacts to livestock grazing would be negligible to minor. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered less than negligible.

5.4.20 Soils

The CIAA for soils is the Project Area. Mining under Alternative A and Alternative B would add 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 approved PR03 (**Appendix A**), as well as other mitigation required under PR03 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 in the CIAA would be minor. *Under Alternative C (No Action) mining would conclude in approximately 2019 when the available coal reserves are depleted at the existing mine and reclamation would last through approximately 2029.* Consequently, cumulative impacts under the No Action are considered less than negligible.

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CHAPTER 6 COORDINATION AND CONSULTATION[1]

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
- 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)
- Eastern Shoshone Chairman and Tribal Council
- Ute Mountain Ute Chairman and Tribal Council
- Ute Indian Chairman and Tribal Council
- Southern Ute Chairman and Tribal Council
- Moffat County
- Rio Blanco County
- Affected Landowners

6.1.1 Public Comment Process

Public comments were solicited via public outreach legal notices published in the Rio Blanco Herald Times and the Craig Daily Press on September 26 and 27, 2013 and again on October 24 and 31, 2013, respectively. The legal notice was also posted in public locations in Craig and Meeker. In addition, a public outreach notice letter was mailed to 45 identified interested parties including Native American Tribes, state agencies, city and county governments, adjacent landowners, and other interested parties. OSMRE created a project website, *http://www.wrcc.osmre.gov/initiatives/colowyo.shtm*, which provided the notice and other project and comment opportunities available on the website. The legal notice and letter invited the public to comment on issues of concern for the proposed Project and informed the public of a public outreach meeting held on November 7, 2013, in Craig. Public comments were received through November 14, 2013, and included the following issues:

[1] *Italicized text denotes language inserted either in response to comments received on the EA (see **Appendix E**) or to clarify or update a topic based on new or additional information received. Each place where italicized text appears is denoted by a bar in the left hand margin.*

- General support of the Project;
- Additional traffic on County roads;
- Increased dust creation;
- Impacts to domestic water wells;
- Increased noise;
- The need for an EIS;
- Impacts to rare imperiled fish, wildlife, and plants;
- Impacts to air quality; and climate change;
- Alternative mining levels; and
- Offsite mitigation for impacts.

A discussion of the issues raised during scoping is discussed in **Section 1.6**.

*OSMRE released the EA on January 19, 2016 for the public to review and comment for a 30 day period ending on February 18, 2016. Comments were accepted via mail and email. A total of 9,761 comment letters or emails were received. Revisions were made to the EA, as appropriate, and responses to comments prepared (**Appendix E**).*

6.1.2 US Fish and Wildlife Section 7 Process

Formal consultation with the USFWS was initiated on September 4, 2012 to determine the potential effects of the proposed Project on threatened and endangered species. The resulting BO from the USFWS was issued on October 30, 2012. On October 27, 2015, OSMRE reinitiated the Section 7 consultation process with USFWS by submitting a supplemental BA. The supplemental BA requested USFWS to reinitiate the consultation process due to the indirect effects of mercury and selenium deposition from combustion of coal on listed species. *A final BO was issued on April 22, 2016.*

6.1.3 Tribal Consultation

Letters describing the proposed Project were sent to the Eastern Shoshone Chairman and Tribal Council, Ute Mountain Ute Chairman and Tribal Council, Ute Indian Tribe Chairman and Tribal Council, and the Southern Ute Chairman and Tribal Council on September 26, 2013, and January 15, 2015. No concerns were raised regarding any specific religious site, sacred site, or traditional cultural property.

6.2 PREPARERS AND PARTICIPANTS

Table 6.2-1 shows a list of the preparers of this EA and those who participated in the preparation of this EA from OSMRE.

Table 6.2-1 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
Jeremy Iliff	Cultural Resources
Alex Birchfield	Ecologist
Jacob Mullinix	Soils Scientist

Table 6.2-2 shows a list of the preparers of this EA and those who participated in the preparation of this EA from BLM.

Table 6.2-2 Bureau of Land Management

Name	Title
Wendy Reynolds	Field Manager (Retired)
Timothy Wilson	Assistant Field Manager
Desa Ausmus	Wildlife Management Biologist
Jennifer Maiolo	Mining Engineer
Kathryn McKinstry	Planning and Environmental Coordinator
Brian Naze	Archeologist
Chad Meister	Air Resource Specialist

Table 6.2-3 lists the participants in the preparation of this EA from the Cooperating Agencies.

Table 6.2-3 Participants from Cooperating Agencies

Name	Title
Amy Laughlin, DNR, Office of the Executive Director	Policy Advisor
Dan Hernandez, CDRMS	Senior Environmental Protection Specialist
Jim Stark, 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
Mark Sprague, Rio Blanco County	County Commissioner

Table 6.2-4 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 Services Inc. and Trinity Consultants.

Table 6.2-4 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
David E. B. Strohm II, Trinity Consultants	Managing Consultant	Air Quality and Modeling

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[1] *Italicized text denotes language inserted either in response to comments received on the EA (see **Appendix E**) or to clarify or update a topic based on new or additional information received. Each place where italicized text appears is denoted by a bar in the left hand margin.*

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Appendix A

Reclamation Plan

Introduction

The Reclamation Plan below has been taken verbatim from the approved PAP for PR 03. This CDRMS approved plan applies directly to Alternative A, the Proposed Action. The plan is also incorporated into Alternative B but will be modified as necessary to accommodate design components of Alternative B that differ from those of Alternative A. The plan can be modified as necessary over time at direction of the agencies or with approval of the agencies as on the ground conditions encountered or other relevant factors may differ from those originally anticipated.

The following plan is excerpted directly from: Colowyo Coal Company, SMCRA Permit C-1981-019, Application for Permit Renewal/Permit Revision, Volume 15, Rule 2, Permits, and Rule 4, Performance Standards; Approved by CDRMS 05/29/2013 as Permit Revision - 03

2.05.4 (1) Reclamation Plan

Introduction

The reclamation plan for existing mining operations including the South Taylor area provide information relevant to the evolution of past reclamation techniques, current reclamation focus, and significant justification for the utilization of variable topsoil depths, slope determinate vegetation communities, and focus on shrub establishment given current emphasis on the greater sagegrouse specifically (Volume 1, Section 2.05.4). The majority of this background information will be referenced as opposed to copied below, unless the context of the discussion makes duplication appropriate. Collom area site-specific details requested by the regulations are included in the following subsections.

The reclamation objective of Colowyo is to restore the mined area to a land use capability that will, be equal to or better than that which currently exists or even better than existed pre-mining based on post-mine land use goals. Colowyo is the primary landowner in the proposed Collom area, and wishes to enhance the post-mine value of the property, both for livestock grazing uses and wildlife utilization. The first objective of all reclamation practices must be to stabilize the soil, maintain hydrologic and vegetation resources, and to restore the mined area to the approved post-mine topography. Ultimately, the areas being mined will be returned to their approximate original use as Rangeland/Fish and Wildlife Habitat with watersheds having their approximate pre-mining character. In general, the long term usefulness of the mine plan area will be similar to that which would have been encountered prior to any mining.

The attainment of reclamation goals will be satisfied by implementation of the reclamation plan described below. Colowyo will combine information from existing baseline conditions with modern practices of reclamation technology utilizing negotiated concepts that currently approved for the existing operation (East Pit, West Pit, Section 16, existing facilities and South Taylor) to assure achievement of the reclamation objectives. Please reference Volume 1 Section 2.05.4 for detailed discussions of past reclamation efforts and justifications for concepts such as variable topsoil depths, slope determinate vegetation community establishment and ethical management of the topsoil resource that apply to the Collom area as well. The pre-mining condition of the permit area has been characterized through collection of baseline data (Exhibit 10 Item 6).

2.05.4 (2)(a) Reclamation Timetable

The sequence for reclamation following the mining process is shown on Map 29B (Spoil Grading – Collom). Final reclamation of the Little Collom X and Collom Lite pits will continue through 2033. A large, temporary out of pit stockpile of approximately 250 million cubic yards will be needed during the initial years of mining. As activities progress, a sufficient volume of backfill void will be created, and the Collom Lite pit should reach a steady state of operation where the advancing overburden face moves southward at the same rate as the advancing backfilling benches. This should occur approximately five years after mining is initiated. At that time, spoil regrading and subsequent reclamation activities will accelerate. The temporary out of pit stockpile is expected to remain in place until the final two years of mining activities. At that time, this material will be needed to fill the final pit void.

2.05.4 (2)(b) Reclamation Costs

The estimate of the cost of reclamation of the proposed operations required to be covered by the performance bond will be found under Rule 3. Appropriate materials will be submitted for review during the technical adequacy phase of permitting.

2.05.4 (2)(c) Backfilling Plan

As mining progresses to the south, overburden material from each successive cut will be backfilled into the previously mined out area and the additional spoil will continue to buildup in previously mined areas. Initially a temporary out of pit spoil pile will be created to the North of the Collom Lite Pit and will remain in place until the end of mine life. Table 2.05.6-5 presents a mine wide volumetric calculation in support of post mining topography and illustrates that permanent out of pit spoil will not be needed.

The backfilled mining areas will be graded to establish a stable post mine topography that blends into the undisturbed areas outside the mining limits (Map 19C). Colowyo will grade all final slopes so that overall grades do not exceed 3H:1V (Map 20C).

Where necessary, the spoil surface will be roughened by ripping or discing etc., to ensure a bond between the topsoil and spoil to reduce slippage. To date there is no evidence of topsoil slippage on reclaimed areas in the existing permit area. A few small tension cracks resulting from settling of fill and topsoil have occurred in a few areas within a year or two after reclamation, but soon stabilize and begin to fill in.

The final surface as shown on the Post-mining Topography Map (Map 19C) will approximate the overall pre-mining grades (Map 19D). Appropriate cross sections that show the anticipated final surface configuration of the proposed permit area, in conjunction with the existing pre-mining topography, are shown on the Pre-mining and Post-mining Cross Section (Map 20C).

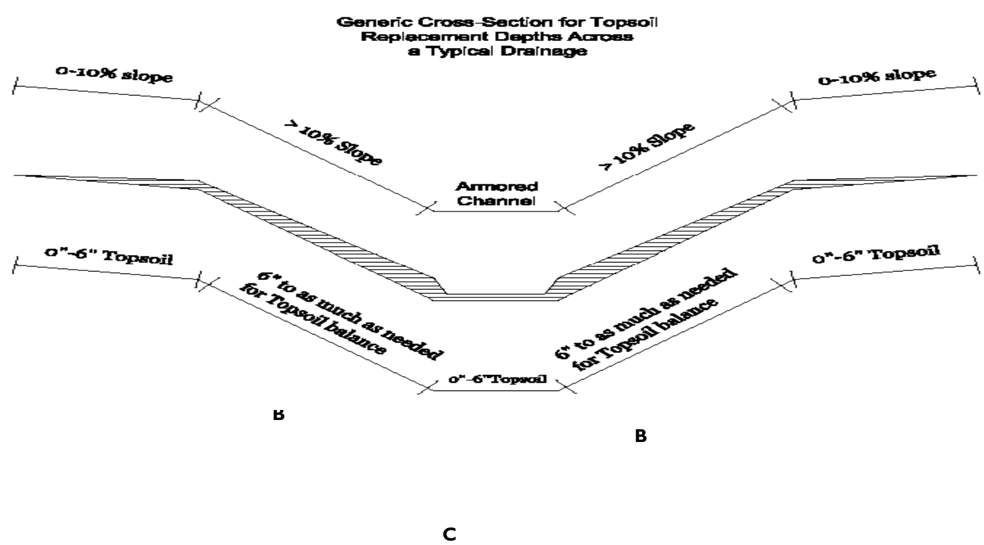
The regrading plan reestablishes escape cover, south facing slopes for wintering big game populations and small drainages suitable as future location of stockponds necessary to achieve the post-mining land use.

2.05.4 (2)(d) Topsoil Salvage

Topsoil Redistribution Plan

Prior to any mining-related disturbances in the Collom area, all available topsoil will be removed from the site to be disturbed as discussed in Section 2.05.3, and will be redistributed or stockpiled as necessary to satisfy the needs of the reclamation timetable as described herein.

Final grading before topsoil placement will be conducted in a manner that minimizes erosion and provides a surface for the topsoil that minimizes slippage. If spoil compaction is a problem, the spoil will be ripped with a dozer to minimize compaction, assure stability and minimize slippage after topsoil replacement. Where possible, development of concave landforms (to encourage snow entrapment) will be developed on a case-by-case basis at the discretion of the field supervisor. Such landforms will still have positive drainage in accordance with overall permitted designs. Topsoil will then be redistributed and graded to a variable replacement depth following the general rule of thin topsoil (<6) inches on ridge tops to gradually thicker topsoil moving down the slopes to the drainage bottoms for the grassland land use targeted areas (see representation below). Sagebrush Steppe areas will ideally receive an average of approximately 4 inches of topsoil that will likely be a more uniform application to encourage proper seeding depth and overall shrub establishment conditions (see representation below). Colowyo will track the volume of topsoil applied to each reclamation unit and report it within the Annual Reclamation Report each year. Colowyo utilizes load counts and time card coding to differentiate and accurately assign costs/volumes for all other material movement on the mine site. As such, Colowyo will utilize these tools to ensure the planned and appropriate volume of topsoil is applied to each reclamation unit in the Collom Area. A visual representation of Colowyo's Collom area drainage-wide topsoil replacement strategy is provided below:



A Generally defined as a "thin" zone of topsoil (0"-6") exclusively applicable to Sagebrush Steppe areas, which will ideally average 4 inches. Areas seeded using the grassland mix will almost always be >10% slope and have > 6 inches of topsoil replaced.

B Collom expansion area topsoil replacement depths will begin with approximately 6 inches at the top of slope breaks >10% and gradually increase to approximately 12-18 inches mid-slope up to potentially 3 to 4 feet down-slope to the base of slopes with armored channels, depending on slope length and topsoil balance considerations.

C Generally defined as the area within armored channels that will receive minimal to no volume of topsoil due to the likelihood any topsoil placed within the structure would erode into terminal sediment control structures and be lost. On-site experience has demonstrated natural sedimentation processes will support vegetation early post construction, and these areas will be seeded via broadcast method to provide a seed source for beneficial species establishment.

NOTE: *Specific details regarding topsoil replacement depths on special planting areas will be included in the description provided for approval prior to the creation of those areas.*

The grassland targeted reclamation blocks will by necessity have thicker layers of topsoil than recent reclamation areas due to reduced volume of topsoil that will be placed on sagebrush steppe areas. Unless Colowyo provides specific justification, the topsoil resource will be placed in a manner that is thin on the ridge tops and gradually increasing in depth to the base of coherent drainages. Large drainage bottom channels in the Collom area that will convey water on a consistent basis will receive little to no topsoil resource as any topsoil placed in these areas will likely be mobilized and washed down the drainage. The full application of seed will still be applied to these areas in order to minimize erosion and allow vegetation to establish in these special locations, adding an additional dimension of potential vegetation community diversity. Topsoil depth variability will be applied in all practical locations to maximize plant community diversity in areas designated for grassland. Because the volume of topsoil to be applied to sagebrush steppe targeted areas is much less, and the creation of a seedbed conducive for shrub establishment is of major importance, the variability of topsoil depths within these areas may be limited. However, wherever practical, Colowyo will also make attempts to vary topsoil depths in the Sagebrush Steppe areas as well. Colowyo will ensure proper topsoil resource management through annual analysis of the topsoil balance in stockpiles, the expected areas for the following year's reclamation focus, the total disturbance area, and the results of topsoil stripping activities each year. Topsoil redistribution criteria specific to sagebrush steppe areas are defined further on in this section.

Starting in 2005, Section 11 of the Annual Reclamation Report presents a summary of topsoil stockpile volumes and a table showing the average topsoil replacement depth for each reclamation polygon, and information on overall topsoil balance.

Topsoil will normally be reapplied by hauling, in trucks, from topsoil stockpiles or from areas where topsoil has been removed for mining advance, to the regraded spoil areas and then redistributed with dozers. Alternate methods may also include placing topsoil on slopes with a dragline followed by redistribution with dozer, or using a scraper to redistribute the topsoil.

It is anticipated that on slopes of < 10% it will be safe to strategically place rows of topsoil in a designated pattern with haul trucks to ensure the desired four to six inches of topsoil can be dozed into position. If a dozer operator doesn't do this properly, he won't have enough material to cover the entire area and it will be obvious what has occurred. Depth control on the Sagebrush Steppe areas will be verified as the project progresses and any deviations from the plan will be rectified at that time. Depth readings will also be taken after the area has been completely topsoiled, sufficient to ensure that Colowyo can demonstrate compliance with the plan. Even if scrapers are used to initially lay topsoil down, it is anticipated that some dozer work will be needed to do the finish work. The required volume of material will be at/on the location. Verification work will lead to additional dozer/scraper work if necessary to ensure proper final placement. If depth control becomes an issue, staking will be initiated as an additional guide for operators.

On areas of > 10% slope it is anticipated that dozers will work together with scrapers to accomplish a gradually thicker application of topsoil on these slopes. As Colowyo has always done, depth stakes at regular intervals will provide guidance to the operators. Depth readings will be taken while the operations are progressing and any issues will be rectified at that time. Depth readings will also be taken after the area has been completely topsoiled, sufficient to ensure that Colowyo can demonstrate compliance with the plan. The allocated volume of topsoil for each area will be hauled to the location, most likely with haul trucks and scrapers as close as safely possible to the final intended location, then dozed into place or placed via scrapers. Verification work will lead to additional dozer/scraper work if necessary to ensure proper final placement.

Colowyo will institute a topsoil depth verification program to document ecologically significant variations in topsoil where applicable (i.e. grassland areas) and confirm more uniform topsoil reapplications (i.e. sagebrush steppe areas). It will consist of recording topsoil depths on five acre centers overlaid on each reclamation unit, similar to re-graded overburden suitability monitoring. Specific depth sampling point locations and results will be recorded and reported in the subsequent years Annual Reclamation Report within the Topsoil Volume Inventory section. The topsoil depth verification program is not intended nor should it be used as a topsoil volume verification method as the volume of topsoil will be planned, monitored and verified through load count, time card coding and engineering plan designation of placement of the material on a reclamation unit basis. Overall topsoil balance oversight is performed and reported annually in the Annual Reclamation Report. The overall goal of both the Division and Colowyo is to replace the entire resource in a manner that promotes the likelihood reclaimed areas will meet the success criteria for Phase III Bond Release after the required liability periods and thereby create reclaimed lands that reflect the desired post-mine land use (grassland and sagebrush steppe).

Reapplied topsoil will be left in a rough condition to help control wind and water erosion prior to seeding. In the case of scraper-applied topsoil, dozers usually cross-rip along slope contours at intervals of about 50-75 feet to provide additional surface roughness. Also, contour furrows are almost always put in place when scrapers are utilized to minimize any sheet flow from the topsoil surface. Due to the specific equipment used for the Sagebrush Steppe areas, topsoil will be left in a more smooth condition to ensure proper seeding depth as described in the text. Any topsoil put into final position with a dozer will by practice be in a state of rough condition. Previous roughening efforts at Colowyo have been extreme, leading to difficulties in placing seed at biologically viable depths. The addition of more contour furrows will reduce sheet flow and moderating the roughness will allow a greater percentage of seed to germinate and provide ground cover that will also alleviate rilling and sediment control issues. As Coloywo transitions into areas of steeper slopes, density of cross ripping will be tightened to increase surface roughness and more contour furrows will be used to break up the slopes and minimize sheet flow conditions and reduce any concentration of flow from rain/snowmelt events. Seedbed preparation, other surface manipulation practices and seeding will be completed primarily during the fall months. Contour furrows, approximately 4-6 inches deep at the deepest point and 20-25 inches wide, which have been used on slope areas very successfully during the past several years, will be used to reduce erosion potential, conserve moisture, and maintain site stability until vegetation is sufficiently established. The size of the furrows may be increased if necessary to control erosion, and the distance between the furrows will vary, but will be approximately 10 to 75 feet along the slope. Small rock check dams may also be used where appropriate to aid in control of erosion both prior to seeding and if necessary, after an area has been seeded.

Colowyo will utilize the planned post-mine topography (PMT) to help identify candidate (and prime candidate) areas for targeting Sagebrush Steppe post-mining communities. Key to this analysis will be considerations for the risk of erosion and for long-term stability. One such "threshold" value to be used for this analysis will be a slope break at 10% gradient. Slopes greater than 10% will be considered too risky to make attempts at targeting shrub communities, largely due to snowpack runoff scenarios that can often lead to serious erosion and stability failures. For example, snowmelt runoff in the early 1980s caused widespread and severe down-cutting of the natural drainages to the immediate west of Colowyo. Unless proven otherwise by hydraulic and/or erosion modeling, slopes less than 10% will be identified as candidate locations for shrub community establishment. Another "threshold" value to be used in the PMT analysis is the size of units that may exhibit slopes 10% or flatter. Areas small in aerial extent (e.g., less than about 5 acres) will not be identified to receive shrub-conducive metrics. Only those areas that are larger will be identified. The exact size cutoff will be at the discretion of the reclamation coordinator; however, a practical limitation must be defined given the complications realized by the change in revegetation targeting measures.

Where Sagebrush Steppe revegetation will be targeted, Colowyo would apply shallow lifts of topsoil (< 6 inches, ideally 4 inches). Where ideal spoil conditions are encountered, special effort will be made to place very minimal topsoil layers (nearly zero). The size of these areas must be small in order to ensure the potential erosion potential created by this activity does not negatively impact areas down slope. The Division will be informed of any instances of "nearly zero" topsoil laydown areas prior to or during topsoil laydown activities to ensure that the Division has the opportunity to verify Colowyo is adequately managing erosive potential. In most cases, due to the general rockiness of Colowyo's spoil, a layer of topsoil is desirable in order to limit damage to the preferred seeding equipment that will be utilized wherever possible in these areas, as proper seed depth placement is a major factor when establishing shrubs. To help maintain topsoil replacement balances, thicker lifts of topsoil (> 6 inches, occasionally up to 2-3 feet) can be placed along the groin of opposing slopes (drainage-ways). On long slopes steeper than 10%, topsoil distribution using pushdown techniques may be altered to facilitate thin layers near the upper shoulders of the slope, with thicker layers near the bottoms. In this manner, the lower elevation areas that tend to catch more snow will receive and store greater quantities of moisture with the hope that some of the mountain shrub seed within the seed mix will be presented with enhanced opportunities for growth and development, especially taxa such as snowberry. The shoulders of the slope, where soil thickness has been reduced will present greater opportunity for sagebrush to develop given reduced competition from cool-season grasses. In order to facilitate proper accounting of the topsoil resource, topsoil placement on specific areas will be tracked by load counts of the equipment involved. In cases where only Sagebrush Steppe acres are reclaimed in one season, replacement volumes may be less than the available 6-inch average. This does not cause undue harm on the resource as the "left over" material will be utilized in the development of deeper soil areas elsewhere in the reclamation progression. All activities will be accurately and fully described within the confines of the Annual Reclamation Reports that include topsoil balance tracking.

Another directive with regard to topsoil distribution (at the discretion of the field supervisor) will be instruction to equipment operators to NOT engineer the final surface, but to the contrary leave it in a very roughened state, where there is the opportunity to diversify the potential plant communities within individual reclamation blocks and further reduce erosion potential. The primary directives in this regard will be to not leave preferential pathways for erosion and to avoid development of surface features that will overly compromise proper seed placement by seeding equipment (e.g., steep and narrow ridges). Sagebrush steppe areas will by necessity be predominately smooth prior to seeding in order to accommodate the special needs of the preferred seeding equipment to be utilized on those sites.

Another topsoil distribution technique that may be used in areas targeting Sagebrush Steppe would be the development of low berms using emplaced topsoil with the aid of equipment such as a road grader (see Volume 1 Figure 2.05-6). For ease of discussion, such berms could be termed "soil fences". These berms would act as natural snowfences trapping wind blown snow to aid sagebrush emergence and development. In this circumstance, a designed amount of topsoil (e.g. 4 inches) would be redistributed over a target area, however, berms would be developed utilizing only the topsoil resource. Where upper layers of topsoil have been pushed aside, a depth of remaining topsoil may be in the 2-4 inch range that should then help to encourage sagebrush emergence while discouraging vigorous grass growth. Where topsoil is bermed, a peak depth up to 16 inches may result. In these thicker topsoil areas, other taxa within the seed mix (or alternate mix) should provide additional competitive advantage. It is critical that berms be constructed on the contour to preclude development of preferential erosion pathways. It is also necessary that berms only be constructed where they will be approximately perpendicular to the prevailing winds, otherwise there is little benefit to be gained. Furthermore, berms would have to exhibit low and rounded shoulders to allow seeding equipment to operate properly. Implementation of techniques such as this must necessarily occur as a result of site-specific opportunity (as opposed to plan) given a variety of factors, not the least of which is availability of equipment and personnel.

As indicated in Volume 1 Figure 2.05-6, the dimensions (in cross-section) would need to be based on the width of seeding equipment to facilitate proper seeding operations, although the widths indicated may be changed in the field, especially given aspect differences. In this regard, sagebrush conducive seed mixes would be applied to the shallow soil areas as well as the uphill-facing side of the berm (west-facing slopes). This is the area that will receive maximum benefit from entrapped snow. The downhill-facing side of the berm would ideally receive the grassland conducive mix owing to the steeper slope (4:1). For easterly aspects, the grassland conducive mix would still need to be applied to the downhill 4:1 slope. As this technique is developed and "proven", modifications to seed mix placement can and should be made as necessary.

2.05.4 (2)(e) Reclamation Revegetation

Colowyo has prepared this reclamation plan with the understanding that some aspects of current reclamation practices are still in the development stages. Therefore, a degree of flexibility has been provided to allow changes and modification as techniques are refined or expanded. Colowyo will continue to evaluate the results of its reclamation plan each year in consultation with the Division and take advantage of each opportunity to try new plant species and materials and new methods for seeding and erosion control. The reclamation standards presented within Volume 15 apply specifically only to the areas disturbed in the Collom Expansion area. This package does not seek to modify or overwrite any standard or practice currently undertaken at the existing operation (Original permit area + South Taylor/Lower Wilson expansion area).

Seed mixtures, revegetation metrics, and bond release protocols designed to target specific post-mining land use components are presented within the context of this section (2.05.4) as well as the revegetation requirements, Section 4.15. Reclamation occurring in the Collom area will focus on the replacement of the pre-mining joint land use: 1) Rangeland (grassland for domestic livestock with wildlife benefit), and 2) Fish and Wildlife Habitat (specifically targeting sage grouse brood-rearing habitat, but also providing benefit to the other endemic wildlife species in the area). The replacement of these two land use subcomponents will be effected by replacement of two primary revegetation communities: 1) grassland and 2) sagebrush steppe, respectively.

The revegetation philosophy utilizing a "prescribed ecological reclamation approach" (PERA), (previously adopted within TR-72, and further modified by TR-82 and TR-84) will be applied to the Collom area to facilitate creation of a wildlife habitat favorable vegetation community (sagebrush steppe) among the more dominant grasslands necessary for livestock grazing and erosion control. Efforts resulting from this approach will be subject to success criteria for bond release as detailed in Section 4.15. Revegetation will specifically target <u>livestock grazing (with wildlife benefit)</u> and <u>sage grouse brood rearing habitat</u>, both of which serve as the joint components of the Post-mine Land Use. Areas designed to target livestock grazing (and utilization by wildlife) will comprise approximately 60% to 80% of the reclaimed landscapes. These areas will principally occupy more steeply sloping ground (>10% slope) where the grassland community is necessary to preclude excessive erosion, especially from snowmelt (Please see Map 46 - Collom Area Reclamation Plan Map). Based on a detailed evaluation of the post-mining topography, the remaining approximately 37% (Map 19D) of the reclaimed landscape will exhibit flat or gently sloping surfaces (<10% slope) with reduced exposure to erosion. It is on the majority of these less exposed more gentle slopes whereby development of wildlife favorable habitats (sagebrush steppe) can be attempted. In this regard, sagebrush communities targeting sage grouse brood-rearing habitat will be attempted in earnest on approximately 30% (or more) of the reclaimed landscape, with the goal of achieving success on at least one-half of this acreage or as otherwise agreed upon between Colowyo and CDRMS. Colowyo provides further description of areas to be targeted for sagebrush steppe establishment later in this section, and describes instances when areas <10% slope will not be targeted for sagebrush steppe establishment.

The principal basis of PERA is to rebuild the foundation conditions of target vegetation communities taking into account the appropriate aspects, slopes, and topographic features of the reclaimed landscape. In this manner, targeted communities, as opposed to more simple grasslands will be more strongly encouraged. Potential reclamation techniques to be applied to facilitate the targeting of sagebrush communities include, but are not limited to: 1) taking advantage of site-specific opportunities for development of convex and concave surfaces to encourage snow entrapment; 2) development of small berms along the contour and somewhat perpendicular to prevailing winds, also to encourage snow entrapment; 3) use of native species; 4) <u>severe</u> reduction of grasses in the seed mix; 5) use of only bunch grasses for those taxa planted with sagebrush; 6) sharp increases in the amount of sagebrush seed to be used; 7) extra care to obtain the correct subspecies of sagebrush (*vaseyana-pauciflora*) with a seed source as close as possible to the Axial Basin; 8) extra care to place seed at the ideal time of year (immediately prior to the first major snowfall event; 9) placement of thin layers of topsoil over overburden; 10) possible placement of zero topsoil; 11) possible placement of thin layers of overburden over topsoil; 12) use of specialized seed placement equipment to obtain correct planting depths; 13) use of seedbed preparation equipment and techniques to encourage sagebrush emergence; and 14) interseeding of additional grasses and/or forbs (only where necessary) following a period of 2 – 3 years of growth by shrubs. All of these possible techniques / metrics are designed to diminish the competitive advantage of grasses, at least in the early stages of establishment and growth. The primary "foundation-building" element for this approach is the ability to replace variable topsoil depths and/or quality of soil materials depending on site-specific needs, the discretion of the field construction supervisor, and the capabilities (or lack thereof) of available materials and equipment.

The following practices will not be promoted or practiced in the Collom area with respect to the topsoil resource: 1) Topsoil will not be "buried in place" within the footprints of existing stockpiles in order to reduce the amount of resource to be moved and placed on reclamation areas. 2) At no time will topsoil be placed without adequate metrics in place to accurately estimate volumes placed within each reclamation unit to ensure an accurate accounting of the topsoil balance. 3) Topsoil will not be placed indiscriminately within reclamation units in a manner that does not serve a specific defendable purpose regarding vegetation type establishment or location within the reclamation unit or localized watershed.

In summary, application of PERA on "shrub-favorable areas" would be based on the community development contributory factors of: 1) soil quantity, quality, and replacement depth; 2) aspect, slope, and landform; 3) documented and expected performance of various floral species; 4) revegetation metrics; and 5) the target post-mining land use. In this manner, reclamation and resultant developing communities will be encouraged to follow a more natural path to maturation and successional progression as opposed to more historically utilized grassland favorable approaches that should only be applied to the remaining 60% to 80% of reclaimed ground (sloping areas). However, there will likely be instances, if not an overall need, to incorporate managerial practices to encourage or protect positive recruitment to the shrub populations. Such management may include the following steps:

- Use of elevated quantities of sagebrush seed within the grassland target areas, and placement of that seed in a manner to encourage sagebrush emergence.

- Use of limited livestock (cattle) grazing to select against grasses and for shrubs and forbs.

- Use of elk-proof fencing to preclude access into large blocks of maturing shrub populations, especially core areas.

- Use of hunting pressure to reduce elk utilization of new reclamation where it can be incorporated in a safe manner given proximity to active mining. Develop special seasons in concert with CDOW for management of "refuge" elk. For obvious reasons, any activity in this regard would have to be designed and approved for implementation in accordance with applicable statutes. Furthermore, approvals from appropriate agencies (CDOW, MSHA, etc.) will be obtained as necessary.

- Use of orchard grass (*Dactylis glomerata*) in key reclamation locations to encourage elk away from maturing shrub populations. It has been documented that this taxon is heavily utilized by foraging elk.

- Implement procedures for micro-habitat development whereby snow catchment is encouraged and shrub heavy mixes can be applied.

- Interseeding of shrubs (as necessary as a normal husbandry practice) within areas not exhibiting satisfactory establishment of shrubs, but still presenting opportunities (micro-niches) for shrubs. Such interseeding would be performed in accordance with Rule 4.15.7(5)(g), and documentation of any such efforts would be provided in the Annual Reclamation Report for that year.

Application of PERA includes management and revegetation specifications (e.g., shrub species in the seed mix) for use on the "grassland" targeted areas that will facilitate additional shrub establishment when climatic or other conditions are favorable. In this manner, small and/or scattered patches of additional shrubland may be established that will provide improved habitat diversity, especially for sage grouse. However, since this type of reclamation is entirely dependent on the vagaries of nature, dependence upon such techniques cannot be relied upon.

Where shrublands evolve on reclaimed lands, they will be segregated into "core" areas and "ecotonal" areas (as is typically evident in nature), each with a separate woody plant density success criterion but both counting as "shrubland". Ecotonal areas are those areas that exhibit shrub-conducive habitat conditions (e.g., thin grass cover, skeletal soils, etc.), but have not as yet developed the more elevated densities of "core" areas. It has been noted repeatedly in the reclamation industry that the 10-year bond responsibility period is often insufficient for the adequate development of shrub populations unless an excellent "take" is achieved at the time of seeding. In this regard, flexibility has been built into the success evaluation process so that if a positive recruitment rate to the shrub population can be demonstrated on Collom area revegetation, there would be no need to achieve elevated densities within a modest time-frame such as the 10-year responsibility period.

Colowyo makes the commitment to establish sagebrush steppe (comprised of both core and ecotonal areas) on approximately 350 acres (minimum of 175 acres core) of the Collom area reclamation or as otherwise agreed upon between Colowyo and CDRMS. This acreage is based on the following rationale: 1) identification of all Collom area disturbance post-mining acreage exhibiting slopes 10% or flatter (Map 19D); 2) elimination of all small, isolated, or impractical areas for targeting this community; 3) implementing "banding" (alternating strips of grassland versus shrubland) procedures on large units with long slopes that might otherwise lead to excessive "snowmelt" erosion; and 4) assuming 50% shrub establishment success (i.e. sufficient density) on the acreage that actually receives shrub conducive metrics. Please refer to Map 19D for a representation of areas that are < 10% slope at Colowyo Mine according to the proposed PMT surface. Also refer to Map 46 for the location of areas to be targeted for either sagebrush steppe or grassland plant communities.

Critical to the adoption of this approach is the need for Colowyo to be allowed to deviate from the plan when opportunities for adding unplanned supplementary areas targeting sagebrush steppe establishment present themselves. Based on the specific safeguards Colowyo will implement to manage sediment control, Colowyo believes it is appropriate to apply shallow topsoil (approximate average of 4 inches) and the sagebrush steppe mix to areas between 10% and 15% slope (as further described at length in this revision) after consultation with the Division without modifying Map 46. Colowyo's Annual Reclamation Report provided to the Division will provide specific details of topsoil applied and the seed mix applied to each reclamation block. Interim revegetation monitoring will identify core areas that would benefit from interseeding, etc. to ensure Colowyo's ability to establish and ideally exceed the sagebrush steppe acreage establishment target. Interim revegetation monitoring efforts will also provide the information necessary to identify the areas that will be formally designated as sagebrush steppe and grassland for Phase III Bond Release data collection purposes. Map 46 identifies areas (according to compliance with the proposed PMT surface) that should exhibit slopes between 0% and approximately 10% and are specifically targeted to receive a shallow application of topsoil and the sagebrush steppe seed mix. Such flexibility will in no way be allowed to circumvent the requirement to maintain a proper life-of-mine topsoil balance and further supports the overall plan objective to improve shrub establishment and meet specified targets such as at least 350 acres of sagebrush steppe establishment with at least 175 acres of core sagebrush steppe establishment. This also includes the ability to take credit for up to 175 acres of ecotonal areas from targeted sagebrush steppe seeded areas and grassland targeted areas (evolved) that exhibit high enough shrub establishment success to qualify for Phase III bond release under the sagebrush steppe criteria. Materials such as Map 46 provide the division with Colowyo's general plan for demonstrating likely success with the specific target listed above and is not a commitment by Coloywo to achieve sagebrush steppe Phase III Bond release criteria on every acre initially seeded to sagebrush steppe. Areas receiving initial sagebrush steppe establishment metrics may be released as grassland if they are later designated as such through interim revegetation monitoring. Colowyo will discuss any planned deviations from the reclamation plan with DRMS prior to their implementation to ensure compliance with the overall goals of the reclamation program. Colowyo doesn't anticipate any changes to the reclamation plan that would require formal revision unless PMT changes are requested that would require DRMS evaluation and approval in addition to any appropriate updates to reclamation plan materials.

Related to this flexibility and as presented in Section 4.15, Colowyo commits to woody plant density success criteria (among several others) for Phase III bond release that are ecologically defensible and appropriate. This commitment is in the interest of promoting the momentum of the bond release process and the pursuit of a "land-use" based reclamation program. Furthermore, this commitment on the part of Colowyo is based on the fact that recent experience and advancements in reclamation science now dictate less stringent requirements for a 10-year bond responsibility period. Historically, woody plant density success criterion, developed more than 30 years ago when Colowyo began surface operations, were established at too high a level over too short a time period to be consistently achievable on a large scale given the technology and regulatory limitations at the time.

Revegetation Plan

Following the retopsoiling of an area, any necessary fertilization, surface preparation, berm development, construction of contour furrows, and seeding of the reclamation will take place.

The reclamation seed mixture for areas targeting grassland (and erosion control), as shown in Volume 15, Table 2.05-7, Reclamation Seed Mixture, contains sufficient diversity for ecological stability and is appropriate for reclamation areas in the Collom area. The seed mixture contains a variety of grasses, forbs and shrub species well adapted to the soil and moisture conditions found at Colowyo. The diverse seed mixture is capable of self-selection for each reclaimed micro-habitat encountered in the reclaimed areas. The diverse seed mixture is required to ensure quick erosion control for the first few years of reclamation as well as obtaining the desired post-mining vegetative community with the same seasonal variety and lifeform of the pre-mined area.

The species and seeding rates indicated on this "grassland" mix resulted from in-depth analyses of past mixes and the resulting emergence and dominance within revegetated areas. A total of eleven different measurement events on Colowyo reclamation coupled with a performance evaluation for each taxon in the 2002 mix resulted in development of the mix indicated on Volume 15, Table 2.05-7 as well as Table 2.05-9. Examples of changes resulting from this analysis include: elimination of streambank wheatgrass (less palatable and redundant with thickspike), elimination of big bluegrass from the grassland mix for lack of performance, elimination of Sainfoin from both mixes for lack of performance, and substantial increases in the amount of sagebrush seed in both grassland and especially sagebrush steppe targeted mixes. These changes, including the planted amounts, have resulted in an increase in the number of seeds per square foot, from 29.2 / ft^2 to 75.7 / ft^2. Much of the increase is due to the substantial increase of sagebrush seed from 0.02 pounds PLS/acre to 0.5 pounds PLS/acre. This change has been adopted to increase the potential for development of shrub patches within the grassland community, to add structural and nutritional diversity to the community and overall wildlife habitat value. If too much sage results from this mix the amount of sagebrush seed can be reduced in subsequent reclamation areas (with Division approval). If excess shrub numbers result from early revegetation efforts, then managerial techniques are readily available to reduce sage populations once the land surface has been transferred back to the landowner if Colowyo does not choose to reclassify the area as sagebrush steppe and apply for bond release under those criteria.

Volume 15, Table 2.05-8, List of Contingency Substitutions for Table 2.05-7 and Table 2.05-9, provides the approved list of contingency substitutions for the seed mixes should certain taxa be unavailable or unwarranted in any given year (also appropriate for use on Collom area reclamation units).

The reclamation seed mixture for areas targeting sagebrush steppe (wildlife habitat – sage grouse brood rearing habitat), as shown in Volume 15, Table 2.05-9, Reclamation Seed Mixture, also contains sufficient diversity for ecological stability and is appropriate for use on Collom area reclamation units. This mixture contains a variety of grasses, forbs and shrub species well adapted to the soil and moisture conditions found in the Collom area and should provide both the structural diversity and life form diversity necessary for habitat requisites of young sage grouse. The seed mixture is capable of self-selection for each reclaimed micro-habitat encountered in the reclaimed areas and contains sufficient sagebrush seed to encourage at least some emergence each year and substantial emergence occasionally.

There is potential, that too much sagebrush seed (115 seeds / ft^2) has been incorporated into this mix, and given recent experience with new planting techniques designed for use at Colowyo in and after 2008, the amount of seed may need to be adjusted at some future point[*]. However, present knowledge within the industry dictates that a significant amount of sagebrush seed is necessary to consistently obtain desired emergence. Present knowledge also dictates that special care must be taken to plant sagebrush seed at precisely the correct depth (~1/16th

[*] By example, as of 2007 the CSU shrub test plots exhibited an average sagebrush population of 3,500 plants per acre. This population resulted from an initial 0.25 pounds PLS of seed in the mix, following an excellent recruitment year.

of an inch) and at precisely the correct time of year (immediately prior to the first major snowfall event of the Fall). The greater the attention given to such details, the greater the potential for successful emergence.

As with the reclamation seed mixture for grassland areas, the species and seeding rates indicated on this sagebrush steppe mix resulted from in-depth analyses of past mixes and the resulting emergence and dominance within revegetated areas. Furthermore, it is anticipated that the reduced competition from grasses, especially sod-formers like thickspike wheatgrass, will result in elevated diversity and better performance from certain poor producers such as big bluegrass, Rocky Mountain Fescue, Louisiana sagewort, bitterbrush, and Wood's rose. If performance of any of these taxa remains poor after additional attempts, they would be candidates for removal from the mix.

Because the amount of grasses (and all sod-formers) has been substantially reduced for this sagebrush steppe mix, it is possible that on occasion, grass emergence may not be satisfactory for erosion control or life form diversity. In such circumstances a supplemental "inter-seeding" with the grassland mix may be necessary to "bolster" the grass and forb component of the community. This activity is allowed under Rule 4.15.7 (5)(g). Such an inter-seeding would only occur if adequate sagebrush or other shrub seedlings have emerged from the initial seeding, otherwise a "reseeding" or "augmented seeding" would be mandated. Furthermore, such an inter-seeding must occur within the first four years from the date of the initial seeding to avoid circumstances that would "reset the bond release clock". If "inter-seeding" is necessary on any units of land, CDRMS will be apprised in the Annual Reclamation Report.

The high rate of seeds per square foot in the sagebrush steppe mix is simply a result of the small seed size for several taxa in the mixture (e.g., sagebrush at 2,500,000 seeds / pound). The individual species have been selected for their habitat forming characteristics for sage grouse during their brooding period. None of the individual seeding rates are excessive given the current state of knowledge, nor is the seeding rate per acre excessive for combination drill / broadcast seeding. However, this mix has not been designed to ensure quick erosion control for immediate stabilization of the topsoil and therefore, should not be used on slopes that exceed 10% without specific attention to managing sheet flow and sediment control. Furthermore, it may need to be planted intermittently (banding) with the grassland mix on long, low-gradient slopes. For additional information regarding this planting technique, see the "Planting and Seeding Methods" section below.

The introduced taxon that is included in the seed mixtures (Volume 15, Table 2.05-7 – Table 2.05-9), (Cicer milkvetch), has been retained in the mix to provide forage for both wildlife (elk, deer and sage grouse) and livestock. Furthermore, Cicer milkvetch is an excellent species for providing necessary habitat requisites for a variety of insects that in turn are especially important to sage grouse broods. It is a well-documented observation that insects comprise a very significant portion of young sage grouse diets.

Similarly, the introduced species, small burnett, has been retained in the contingency species list (Volume 15, Table 2.05.8) owing to its well documented value to wildlife.

Data on reclaimed areas at Colowyo, has indicated that orchard grass is an important grass species for controlling erosion and providing cover the first growing season, while decreasing subsequent growing seasons. Orchard grass comprised 0.13 plants per square foot the first growing season, while decreasing to less than 0.02 plants per square foot the second growing season. This indicates the effectiveness of orchard grass to provide erosion control early on revegetated areas, while not sustaining this vigor in later years due to increased competition and crowding by other species as well as targeted selection by elk (i.e. it has been repeatedly observed in Colowyo reclamation, that orchard grass plants have been selectively consumed by resident elk, and therefore, can be considered highly desirable forage).

There is a place for certain introduced species in Colowyo reclamation. Occasional use of introduced species may occur, but will be limited (as indicated in the seed mixes) to specific circumstances. The only circumstances where limited use of introduced species will not be followed are instances where a unit of land is designed to target a post-mine land use of "pastureland" or a unique area is highly susceptible to erosion. Use of the more aggressive taxa: smooth brome, intermediate wheatgrass, and pubescent wheatgrass will be avoided, with the possible exception of "pastureland". Prior to such land use designation or use of aggressive taxa to combat areas that are highly susceptible to erosion, an MR or TR (as appropriate) will be obtained from CDRMS to address such circumstances.

Revegetation activities in the Collom area will be conducted during the first normal planting season following the application of topsoil and preparation of the site for seeding. The most favorable times for seeding in this area are in the early spring and late fall. Spring seeding is usually severely limited by high soil moisture conditions, which prohibit the use of seeding and seedbed preparation equipment at a time when conditions are best for germination and seedling establishment. For this reason seeding will primarily be done during late fall months immediately prior to the average occurrence of the first significant snowfall event when the conditions for seeding are optimal. A modest amount of broadcast seeding may occur at other times including early spring, as detailed under Planting and Seeding Methods in this Section, but typically only for small "mop-up" circumstances.

Given the significant and nearly ubiquitous past failures regarding the establishment of shrubs on Coloywo's reclamation areas, the only proven technique for use in the Collom area is direct seeding of these species, which has demonstrated some success historically at the existing operation. Previous alternative shrub-establishment methods, specifically the use of containerized saplings and live local transplants will not be incorporated into the greater strategy for large scale shrub establishment efforts. However, at CDOW's request, Colowyo has agreed to randomly incorporate approximately 750 small (36 square foot) enclosures into future reclamation areas at a density of approximately five enclosures per acre on 150 acres. The specific locations of these enclosures will be identified on the subsequent Annual Reclamation Report Map following their implementation each year. These enclosures will contain tublings (containerized stock) of serviceberry and chokecherry to ensure there is a presence of these species on the greater reclamation surface. These enclosures will be fenced to prevent predation by wildlife and the surface of the enclosures will be covered by weedguard fabric to reduce competition from other plant species. While there is no specific performance criteria associated with these enclosures, they will be monitored periodically via interim revegetation monitoring efforts with the goal that at least one tubling per enclosure survives until the reclamation area it is contained within is released from liability through the Phase III Bond Release process. Protective fencing will be removed immediately prior to or immediately after Phase III Bond Release is granted as directed by DRMS staff at the time. Additional efforts, such as adding snow fencing near enclosures, can be implemented if it is determined extra moisture is necessary to help establish the tubling serviceberry and chokecherry plantings.

With regard to out of pit road embankments, where possible, road cut slopes will be reduced from 1:1 to 3h:lv, retopsoiled, seeded, and mulched. Cut and fill slopes will likely be left in a roughened condition during construction, and then topsoiled, mulched and seeded post construction. Please refer to the construction notes on Map 25E Sheet 3 of 9 for additional details regarding stabilization methods. The seed mixture to be utilized for road cut outslope stabilization can be observed in Section 4.03.2 of this application. Species were chosen to ensure rapid establishment and sediment control.

Upon the completion of all coal mining and reclamation operations by Colowyo in the Collom Area, the office, shop, coal crushing facilities and other related surface facilities will be removed and the sites reclaimed according to the grading, topsoil and revegetation procedures set forth in this plan, providing there are no continuing beneficial uses for these structures.

Reclaimed areas will be appropriately fenced, if necessary, to manage grazing or browsing by livestock or wildlife. With regard to shrub establishment areas, the design is to provide sufficient seed for the development of more than adequate populations. If it is determined that marginal populations evolve and warrant protection, or excessive damage (severe hedging) to those populations is noted, those areas of sufficient size (e.g., 10 acres and larger) or sufficiently proximal to each other, may be fenced with elk-proof fencing at the discretion of Colowyo's reclamation coordinator. This practice would occur to ensure that reclamation would meet the established success criteria.

Planting and Seeding Methods

Planting and seeding methods will vary depending on degree of slopes, reapplied topsoil depth, new techniques, targeted community, etc.; however, the same planting sequence will be used in most cases. Seeding will occur during the Fall, immediately prior to the average first permanent snowfall event (typically mid to late October). If seeding cannot be completed prior to seasonally permanent snowfall, "mop-up" broadcast seeding may occur in the Spring as soon as ground conditions allow. Components of the proposed seedmixes that would normally be applied via drill seeder will be applied at double the seeding rate identified on the seed mix tables for these "mop-up" efforts and in cases where a drill seeder can't be used safely to apply the mixes.

Following seedbed preparation, grassland targeted areas will be drill seeded with a heavy duty rangeland drill with depth bands using the perennial mixture as shown on Volume 15, Table 2.05-7, Reclamation Seed Mixture - Grassland. At times, broadcast seeding may be required on steeper areas, wet areas, very rocky areas, or simply on areas that were missed by the drill seeding equipment. Broadcasting can be used in conjunction with the drill seeding equipment to broadcast a portion of this mix as indicated on Volume 15, Table 2.05-7. A very light "tine harrow" or similar equipment may be dragged behind to facilitate a light cover of soil (~1/16 inch) over the broadcast seed. In this manner, the small seed for species such as fescue, yarrow, and sagebrush will be placed in a more optimal manner for emergence. This procedure (where the broadcaster is mounted on the seed drill) will facilitate a "one-pass" seeding procedure. The utilization of a Truax/Trillion/Brillion drill would also facilitate a one-pass option.

Following seedbed preparation, sagebrush steppe targeted areas will be seeded with one of three scenarios using the perennial mixture as shown on Volume 15, Table 2.05-9, Reclamation Seed Mixture – Sagebrush Steppe. The first scenario would be identical to grassland targeted areas whereby a heavy duty rangeland drill with depth bands would be used for taxa to be drill seeded along with a mounted broadcaster and light tine harrow (for those taxa indicated for broadcast seeding). This process would facilitate a "one-pass" seeding procedure. The second scenario would be separation of the drill seeding and broadcast equipment that would require a "two-pass" seeding procedure.

The third scenario (preferred) would involve use of equipment such as a "Trillion" cultipacker type broadcast seeder (or dribbler) to plant the entire mix indicated on Volume 15, Table 2.05-9 in a single pass. The trillion seeder has been developed specifically for "precision seed placement" by "combining the Truax seed box design with Brillion cultipacker rollers". Use of this equipment means obtaining the seed mix with the seed blended in three separate categories for use in the three separate seed hoppers: 1) small flowable seeds, 2) fluffy seeds, and 3) flowable large seed. (Filler material will also need to be added to these different hopper mixes, as appropriate, to facilitate the correct metering.) The trillion seeder firms the seedbed with the front row of cultipacker wheels, dribbles the seed immediately following, and then "imprints" the seed to the correct depth with the rear set of cultipacker wheels. Where the ground is uneven due to soil clods, rocks, or woody debris, proper seeding will require slower travel speeds. If the seedbed is too uneven or "cloddy", it will need to be broken and modestly smoothed by discing, harrowing, or chiseling to the point where equipment such as the trillion will work effectively. Otherwise, most of the seed will not be imprinted to the proper depth and the risk of a seeding failure would be substantially elevated.

Research into the use of these techniques, especially with "brillion" style seeders in Wyoming and Idaho has indicated substantially elevated probabilities for success of sagebrush establishment at, or greater than, the desired densities. Other procedural recommendations based on recent successes in Wyoming and Idaho include: 1) proper seedbed preparation [standard agronomic practices]; 2) placement of sagebrush seed at a very shallow depth (≤5mm); 3) planting substantially elevated quantities of seed in comparison to past conventions [at least 80 - 100 seeds/ft^2 has been recommended by Agricultural Research Service studies in Wyoming]; 4) planting seeds into a firm seedbed with only a light covering of soil; 5) planting with direct-haul topsoil (as opposed to stockpiled) whenever possible; 6) planting into soils with textures of silty-loam to sandy-loam where possible; 7) use of few-flowered Mountain big sagebrush (*Artemisia tridentata* var. *pauciflora*) seed in the Colowyo environs; 8) use of sagebrush seed collected from as close to the Axial Basin circumstances as possible; 9) planting mixes that exhibit significantly reduced quantities of grass seed; 10) supplement with additional grass seed (if necessary) two to three years after sagebrush seedlings have emerged; and 11) placement of grass, forb, and shrub seed in differing rows to reduce interspecific competition when practical.

As previously indicated, sagebrush steppe revegetation will be primarily targeted on slopes exhibiting gradients of 10% or flatter in the Collom area. At the discretion of the reclamation coordinator, the sagebrush steppe mix may be applied to additional areas (up to 15% slope) for given opportunities that may be presented. However, in any such circumstances where 10% slope is exceeded, specific sediment control measures such as surface roughening, contour furrows and seeding on the contour of slopes is a necessity.

Mulching Techniques

Mulches tend to shade the soil, thus slowing the rise in soil temperature needed for germination of seeds. At Colowyo, soil moisture is not usually a limiting factor. Soil moisture is usually very high during the spring, due to precipitation during the winter and early spring months. The summer months are generally dry, often with little additional precipitation. By not utilizing mulch, soil temperatures are increased earlier in the spring, thus enabling the seeds to germinate earlier when soil moisture conditions are optimum. When the seeds germinate earlier, they are able to utilize soil moisture earlier in the growing season. This results in further root development by the plants, aiding survival through the dry summer months.

Surface manipulation methods such as contour furrows, drainage benches and permanent drainage channels will be utilized to eliminate any sediment control issues sometimes rectified by using mulch. Where deemed necessary by the reclamation coordinator (e.g., sagebrush steppe targeted areas, south-facing slopes, etc.), techniques such as mulching, chisel plowing, or discing on the contour will be reinstated as necessary.

Please refer to Volume 1, Section 2.05.4 for further historical context and discussions concerning mulching reclamation areas on Colowyo reclamation.

Irrigation

No irrigation is planned for areas to be seeded.

Pest and Disease Control

Noxious plants, as defined in Section 1.04, will be managed in accordance with the following section – "Weed Management Plan". If insects become a problem to the point where they endanger the successful establishment of the seeded vegetation on the reclaimed area, they will also be controlled using methods suggested by the Colorado State University Extension Service. All herbicides and pesticides utilized will be those that are approved by the appropriate state and federal governmental agencies responsible for the approval and distribution of such agents.

Weed Management Plan

A listing of Colorado's noxious weeds (A, B, and C lists) as well as Rio Blanco and Moffat Counties' listed taxa are provided in Volume 1, Table 2.05-10 along with identification of those taxa that have been observed on or near the Colowyo mine and Collom area. As indicated on this table, there are no "A" list taxa known from the area. "A" list taxa must be eradicated. To the contrary, there are seven (7) "B" list (must be managed) taxa known from the environs of the Colowyo mine as well as three (3) "C" list (management may be required by local governments) species. Of these 10 species, common mullein and poison hemlock from the "C" list, and Russian olive from the "B" list are not overly problematic and will normally not require attention. In fact the Russian olive was purposefully planted in previous Colowyo reclamation. If "infestations" of common mullein or poison hemlock evolve, they will be treated in the same manner as the more problematic species.

The remaining seven species: hoary cress, musk thistle, Canada thistle, bull thistle, houndstongue, black henbane, and downy brome (cheatgrass) will be the primary focus of the program and will likely receive attention as appropriate in the Collom area. Of these seven species, the first six will be specifically targeted for remediation while the seventh, cheatgrass, will be carefully monitored to determine if it becomes problematic in older reclamation[*]. If it becomes problematic, it will receive similar attention as the other six species. In addition, continued monitoring of reclamation will focus on identification of any new noxious weeds.

For the most part, noxious weeds observed on or near Colowyo reclamation do not achieve "infestation" levels. By infestation, Colowyo means: 1) relative cover contribution of one noxious weed species or a combination of noxious weed species exceeding three percent in a revegetated stand; or 2) a "patch" of any listed species in which the noxious weed component exceeds 25% relative cover and occupies an area larger than 100 square feet on any disturbed area. Rather, noxious weeds tend to occur as scattered individuals or small pockets of individuals. This distribution suggests that spot control will be the only effective procedure that can be utilized.

To manage these six noxious weed specie populations, Colowyo will either perform itself, or contract out, annual weed control activities. Weed control will typically involve herbicide application at the appropriate rates and during the appropriate life stages (as possible) to affect control. Spot applications will be preferred over "blanket" applications to prevent loss of desirable reclaimed taxa such as seeded forbs and shrubs, however, blanket application may be necessary if any infestation areas are observed.

All Colowyo environmental staff, state inspectors, consultants, or contractors will be requested to remain vigilant for pockets of noxious weeds in the reclamation. If larger concentrations are observed, they will be mapped, recorded with GPS, or other means of identification to facilitate control by weed spraying crews. Both the weed spraying crew and the revegetation monitoring crews will be especially important in this regard.

In addition to revegetated areas, vigilance will be maintained for other locations conducive to noxious weed populations. Such areas include: riparian areas, topsoil piles, major traffic areas, road cuts and fill slopes, ditches, pond embankments, non-use areas, etc.

Weed control measures may include mowing, discing (conventional cultivation), burning, grazing, or applying an approved herbicide. Weedy annual species (such as pennycress) with a single season life cycle provide initial site stabilization and moisture conservation in newly seeded reclamation sites; as such they will not be specifically targeted for control. Historically, seedings on reclaimed sites have greatly out competed annual weed infestations within three or four growing seasons.

Specific control measures will be selected by evaluating the location, growth characteristics and vulnerability of each weed. Management efforts will begin after proper planning and evaluation are performed. Proper use of chemicals applied during weed control is ensured by oversight of

[*] Although it cannot be discerned with 100% certainty, it appears that cheatgrass patches and populations in Colowyo reclamation, tend to succumb to successional pressure exhibited by the adapted perennials. In this regard, it appears that cheatgrass populations drop off to low levels in mature reclamation.

weed spraying activities by individual(s) certified by the State of Colorado to handle and apply herbicides.

Colowyo reserves the right to change and modify the practices and materials it utilizes within the weed management program to achieve compliance with all applicable state and federal rules and regulations. Colowyo will evaluate each infestation on an individual basis in order to ensure proper methods, timing, materials and manpower are utilized for maximum effectiveness.

Measures for Determining Success of Revegetation

The success of revegetation is explained in subsection 4.15.

Soil Testing Plan

From conception to the mid-1990s, Colowyo tested for topsoil fertility. In order to assure that the reapplied topsoil will support the proposed post-mining land use of rangeland, a soil sampling program will be implemented. Soil samples were taken randomly over each retopsoiled area and were analyzed for nitrate-nitrogen, phosphorus, and potassium. Historical results indicated adequate nutrient value to support post-mining revegetation.

Colowyo has demonstrated through numerous years of monitoring that topsoil fertility is not a concern at the mine; this is mainly due to the nutrient rich soil that is commonly present throughout the region. As a result, Colowyo has suspended the soil testing program requirements, until such time as Colowyo determines that the soil fertility adversely affects the reclamation and/or the post-mining land use.

As needed other soil amendments will be added to the reclaimed areas to support reclamation efforts. To date there are no indications that Collom area topsoil resources will require amendments due to the pre-mine vegetation communities identified for both the existing operation and areas identified for disturbance in the Collom area being so similar.

4.06 TOPSOIL

The topsoil removal, storage, and redistribution plan for the proposed disturbed area associated with the Collom Lite and Little Collom X mining areas will follow the procedures described Section 2.05.3 (5) and 2.05.4 (2) (d) of this Permit Revision document. Additional information regarding the topsoil resource may be found in the Collom Soils baseline survey located in Exhibit 9.

General Requirements

Before the disturbance of any area, topsoil is removed and segregated from other material. Upon removal, this material is either immediately redistributed on regraded areas or stockpiled in locations shown on the Topsoil Handling Map 28C.

Removal

All topsoil, as classified in section 2.04.9, is removed from areas to be affected by the surface coal mining operations. The graphical representation of the topsoil removal is shown on the Topsoil Handling Map (Map 28C). This map has been greatly simplified from that of the original application to reflect actual on-the-ground operations. The techniques for removal of woody plant materials that otherwise would interfere with the usefulness of the topsoil is discussed in Section 2.05.3

The average thicknesses for each soils series to be removed can be found on Table 2.04.9-16 as defined in Table 2.04.9-19. Removal techniques for topsoil are described in Section 2.05.3.

A variance from topsoil removal was requested and approved by the Colorado Division of Minerals and Geology previously in the existing permit area for the following areas; construction of small structures such as power poles, signs or fence lines, areas of light traffic that do not destroy existing vegetation or cause erosion and areas where removal would result in needless damage to soil characteristics such as sediment control ditches and small water diversions. In most cases, especially on steep slopes, removal of topsoil prior to ditch construction needlessly damages large areas of topsoil, along with the adjacent natural vegetation. Implementation of the technique of cutting the ditches directly into the hillside without topsoil removal will limit needless topsoil disturbance, reduce unnecessary destruction of adjacent vegetation and will facilitate reclamation of the ditches at a future date. As this revision is an extension of the existing permit, Colowyo would expect this flexibility to transfer to the Collom mining area with all applicable conditions in full effect.

It should also be clarified that consistent with Exhibit 9, there will be small areas of rock outcrop, rocky steep slopes, etc. where the topsoil depth is 0 inches. Where this occurs there will not be an attempt to recover topsoil or otherwise disturb the area before disturbance by mining.

Colowyo does not plan to use overburden material for topsoil substitutes or as a supplement to topsoil. Colowyo will remove topsoil before any mining operations commence and always maintain a buffer zone between the area stripped of topsoil and the overburden drilling and blasting operations. As depicted on the Topsoil Handling Map (Map 28C), the topsoil handling program will result in an orderly sequence for the continuous removal, storage or reapplication of topsoil. The redistribution of topsoil will be done at a time when the physical and chemical properties of the topsoil can be protected from alteration while minimizing the potential for erosion.

Topsoil and vegetation matter is typically windrowed, sloped and seeded during initial sediment pond construction and saved for reapplication when the pond is reclaimed at future date.

The pond embankments are constructed utilizing in-place materials directly below the upper topsoil zone. This colluvial material supports vegetative growth and will also be utilized at a future date for pond reclamation. If necessary, Colowyo will apply an appropriate amount of topsoil to pond embankments that do not readily revegetate post construction.

Storage

The estimated quantity of topsoil in stockpile may be found in Section 11 of the Annual Reclamation Report. Topsoil stockpiles exist for support facilities and the mining area. All of the existing or proposed stockpiles result where immediate redistribution will not be practical, either because redistribution areas are not available at the time of topsoil removal, or because more topsoil is being removed than what will be necessary for immediate redistribution. Any additional stockpiles may be placed on flat spoil backfill areas or stable portions of the permit area where stockpiles will be protected from external effects of both wind and water erosion.

Stockpiles have also been placed to avoid disturbances other than those incidental to their deposition and removal.

Colowyo utilizes a variety of methods to protect topsoil stockpiles from erosion. Colowyo will utilize one or more of the following techniques to protect topsoil from erosion. Small catchment berms and ditches may be employed to route surface runoff away from stockpile areas. Small sumps or dozer basins may be employed to collect runoff. Adjacent disturbance areas may be ripped or otherwise roughened to reduce runoff. Topsoil stockpiles may be strategically placed and constructed to allow runoff to be routed around stockpile locations rather than pond against a stockpile.

Topsoil marker signs will be placed on each stockpile to prevent inadvertent disturbance, unnecessary compaction or contamination.

At the locations where topsoil piles are located on undisturbed land, in place topsoil and vegetation will not be removed prior to stockpiling topsoil.

The topsoil stockpiles will be seeded with the following perennial seed mixture to control erosion:

Western wheatgrass @	4 Lbs PLS/Acre
Thickspike wheatgrass* @	4 Lbs PLS/Acre
Yarrow** @	0.15 Lbs PLS/Acre

*option to replace Thickspike wheatgrass with Beardless bluebunch wheatgrass or Sheep fescue
**option to replace Yarrow with Cicer milkvetch

Topsoil stockpiles will be drill seeded to the greatest extent possible. The remaining areas will be broadcast seeded.

In those areas where topsoil is stripped and hauled directly back to contoured backfill, some of the established native species can be expected to occur in the revegetated area.

As a general rule, stockpiled topsoil will be moved only when required for redistribution on disturbed areas prior to seeding. Exceptions to this practice may occur to facilitate mining, construction of sediment control ditches, ponds, etc. Approval from the Division will occur prior to moving stockpiled topsoil for purposes other than staging prior to reclamation activities or laydown to facilitate seedbed preparation.

All topsoil stockpiles should be protected with a ditch and berm around their perimeter to conserve the resource.

Redistribution

After the final grading is completed, the topsoil will be reapplied as shown on the disturbed land areas shown on the Topsoil Handling Map (Map 28C). Future topsoil redistribution will be done at a predominately variable depth based on the volumetric analysis of available materials and areas as presented in Rule 2.05. Historical replacement depths for reclaimed area units are tracked in the Annual Report.

Where necessary, to prevent slippage surfaces and promote root penetration the spoil will be scarified by ripping and/or rough grading. This practice will assure a solid bond between the spoil and reapplied topsoil. To date, there is no evidence of topsoil slippage on reclaimed areas. A few small tension cracks resulting from settling of fill and topsoil have occurred in a few areas within a year or two after reclamation, but soon stabilize and begin to fill in.

Since all available topsoil existing on areas to be disturbed will be removed and reapplied, it will be fully capable of supporting growth necessary for the proposed post-mining land uses. Compaction may be alleviated through chisel plowing or ripping on the contour with a track dozer. The method of topsoil replacement most often used at Colowyo, which makes use of dozers, leaves the surface in a rough condition which minimizes wind and water erosion. The use of other roughening techniques following topsoil replacement and the construction of contour furrows at the time of seeding or before will also aid in erosion control where needed.

Reconditioning

Topsoil quality at Colowyo is excellent in terms of providing a suitable plant growth medium capable of supporting the approved post-mining land use and the revegetation requirements of Section 4.15. Soil testing has not indicated any deficiencies. Refer to Volume 3, Exhibit 10, Establishment of Native Shrubs on Disturbed Lands in the Mountain Shrub Vegetation Type. This study was conducted on the Colowyo Mine July 1975 through December 1979. Colowyo has the option to apply 50-70 pounds of phosphorus per acre to all safely accessible reclaimed mine areas prior to chiseling and seeding.

4.07 SEALING OF DRILLED HOLES AND UNDERGROUND OPENINGS

Drill holes and underground openings will be sealed in accordance with the procedures outlined in the previously-approved permit document.

4.08 USE OF EXPLOSIVES

Explosives will be used for blasting in accordance with the procedures and specifications presented in the previously-approved permit document. Map 26B presents distances to various structures of possible concern surrounding the mining area. Only Section 4.08.2 has changed from the original permit; see the original permit for Sections 4.08.1 and 4.08.3 through 4.08.6.

4.08.2 Pre-Blast Survey

In accordance with Rule 4.08.2(1), pre-blast surveys will be offered to owners of all structures within one-half mile of the permit area. Pre-blast surveys will be conducted on residential structures located near the Collom permit expansion area, various associated groundwater supply wells, power pole foundations located near the permit expansion area, and a pipeline. Copies of completed assessments will be included in Exhibit 14, Item 7 after the structure assessments have been completed. All blasting within the Collom area will be conducted in accordance with the blasting parameter described in Volume 1, Section 2.05, Blasting.

Blasting Records

Colowyo will keep a record of each individual blast by utilizing report formats shown in Volume 1, Figure 2.05-2 - Blasting Report (coal and overburden), and Volume 1, Figure 2.05-3 – Colowyo Chargeweight Sheet (overburden only).

Pre-Blasting Survey

In accordance with Rule 4.08.2, written notification will be provided to all residents and/or owner of dwellings or other structures that are located within one-half mile of the Collom permit expansion area. Copies of the letters will be included as an exhibit in the permit documentation under Exhibit 14, Item 8.

Pre-Blasting Surveys specific to the Collom permit expansion area will be conducted prior to commencement of mine operations at the Collom permit expansion area. Due to the proximity of the permit expansion area to the existing Colowyo permit area, many of these residents and owners may remain unchanged. As pre-blasting surveys are completed, a list of individual owners, subject to blast disturbance, will continue to develop. Preliminarily identified residents that may experience blasting related may found in Exhibit 14, Item 8.

Colorado Oil and Gas Registered Facility Locations

There are three locations within the proposed permit boundary extension for the Collom Mining Area (Map 11B – Drill Hole Locations) that are identified in the Colorado Oil and Gas Conservation Commission database. They are described as follows:

1) ID# 05-081-07203 – Plugged and abandoned oil exploration well. Owned by Infinity Oil & Gas of Wyoming, completed in December, 2004. Plugged and abandoned July, 2005.
2) ID# 05-081-06328 – Plugged and abandoned oil exploration well. Owned by Tiger Oil Company, completed February, 1978. Plugged and abandoned February, 1978.
3) ID# 05-081-06339 – Planned oil exploration well location permitted but well was not constructed and the drilling permit was allowed to expire in May, 1978. Owned by Tiger Oil Company.

4.09 DISPOSAL OF EXCESS SPOIL

Spoil removed from the Collom Lite and Little Collom X pits will be stockpiled in a temporary fill area as shown on Maps 23B and 29C (Temporary Spoil Pile Design). Map 29B shows the timing of spoil grading completion and the initiation of reclamation activities. Volume 20, Exhibit 23, Item 1 provides the geotechnical report for the temporary spoil pile. Colowyo expects a swell of excavated materials; therefore, all of the material stockpiled in the temporary fill will remain at the conclusion of the project as shown on Map 19C. No excess spoil is anticipated for the mining and development of the Collom Lite or Little Collom X Pits. Additional discussion of the temporary spoil pile can be found under Section 2.05.3(6).

<u>CONSTRUCTION PLAN</u>

All available topsoil will be removed and either stockpiled for later use or direct haul replaced to a reclaimed area. No excess spoil is expected under the current Mine Operation Plan. Should disposal of excess spoil be anticipated, a construction plan will be developed. Colowyo will follow the recommendations for excavation and fill construction as described in Shannon and Wilson's report in Exhibit 23, Item 1.

INSPECTION PLAN

Should plans change and permanent disposal of excess spoil occur out of pit, during construction of the Fill, Colowyo will provide the following information in certified reports as required by Rule 4.09.1(11).

1. Inspections will be conducted at least quarterly during the construction period and during the following specific construction periods.

    a. removal of topsoil and organic material

    b. placement of underdrain system

    c, installation of surface drain system

    d. placement of fill material to insure that the largest rocks are reaching the bottom of the dump face and that the formation of voids that adversely affect mass stability are prevented and

    e. revegetation

The purpose of the inspections is two fold. First, these inspections will document and certify that the construction plan is being followed. Secondly, during the above phases of the construction, a key emphasis of all inspections will be to implement routine contingencies as situations warrant. For example, perhaps a section of underdrain should be reworked, or the spoil dump raised to provide optimum gravity spoil sorting. Inspections and implementation of contingencies during these critical phases of fill construction will be a routine but very important component of fill inspections.

2. Each certified inspection report will be provided to the Division within two weeks after each required inspection. Each report will certify that the fill has been constructed as specified in the minimum design approved by the Division. The reports will include a description of any appearances of instability, structural weakness and other hazardous conditions observed during the inspection.

3. Certified reports addressing the underdrain system will include color photographs taken during and after construction, but before the underdrain is covered with spoil.

After construction, the fill will be monitored quarterly for the following items and reports will be submitted in the Annual Reclamation Reports. Monitoring will continue until such time that DRMS staff approve a revision to this plan.

1. The groundwater piezometer well will be established in the valley bottom and will be monitored quarterly for water level and the other parameters consistent with the present Colowyo groundwater monitor plan.

2. On a quarterly basis, a certified report by a registered engineer will be completed taking into consideration any changes and will note any evidence of surficial slope failure or the formation of springs or seeps on the face of the fill.

4.10 – 4.12 DISPOSAL OF EXCESS SPOIL

These sections are addressed in the original permit.

4.13 CONTEMPORANEOUS RECLAMATION

All reclamation efforts, including backfilling, grading, topsoil replacement and revegetation of land disturbed by the mining activities in the Collom Lite and Little Collom X pits shall occur as contemporaneously as practicable with mining operations. Implementation of the reclamation plan, as described in Section 2.05.4, will assure that each step in the reclamation process is completed in a timely manner. Colowyo is formally requesting a variance for a delay in contemporaneous reclamation in the Collom Lite and Little Collom X mining areas as the requirements listed in Rule 4.14.1(1)(d) are unachievable.

The sequence for reclamation following the mining process is shown on Map 29B (Spoil Grading – Collom). Final reclamation of the Little Collom X and Collom Lite pits will continue through 2033. A large, temporary out of pit stockpile of approximately 250 million cubic yards will be needed during the initial years of mining to establish the initial boxcut configuration for the Collom Lite and Little Collom X pits. Full establishment of the Collom Lite Pit Boxcut should occur approximately five years after mining is initiated and backfilling activities should begin during that timeframe as illustrated on Map 29B. At that time, spoil regrading and subsequent reclamation activities will accelerate. As activities progress, a sufficient volume of backfill void will be created, and the Collom Lite pit should reach a steady state of operation where the advancing overburden face moves southward at the same rate as the advancing backfilling benches. The temporary out of pit stockpile is expected to remain in place until the final two years of mining activities. At that time, this material will be needed to fill the final pit void.

Colowyo is currently targeting many coal seams at this time and an eventual box cut depth of approximately 600 feet in the Collom Lite Pit as illustrated on Map 24C. Colowyo currently operates under a variance for contemporaneous reclamation under pit configurations less than half as deep as the Collom Lite pit, mining fewer individual coal seams in the process.

Because of the multi-seam nature of the mining operation described in Section 2.05, backfilling and grading cannot be completed within 180 days following coal removal. Backfilling and grading will be completed in variance of the 180 day requirement in a manner previously approved and described below, and in Sections 2.05 and 4.14.1. As shown on the mining Typical Pit Cross Section (Map 24C), mining will be carried out in any one area for a considerable length of time (approximately five years to reach the lowest coal seam). A series of benches will be necessary in the operation to recover the lower coal seams, and an additional series of benches will be necessary to dump the shovel/truck overburden material in a configuration that achieves the topography shown on the post-mining Topography Map (Map 19C). When multi-seams are mined, backfilling and rough grading cannot begin until the lower-most seam is mined. See Spoil Grading Map (Map 29B), which shows the time frames in which grading will occur in relation to the time of removal of "X" seam coal, which is shown on the Mine Plan Map (Map 23B).

As mining progresses to the south, overburden material from each successive cut will be backfilled into the previously mined out area and the additional spoil will continue to buildup in previously mined areas. Initially a temporary out of pit spoil pile will be created to the North of the Collom Lite Pit and will remain in place until the end of mine life. Table 2.05.6-5 presents a mine wide volumetric calculation in support of post mining topography and illustrates that permanent out of pit spoil will not be needed.

The backfilled mining areas will be graded to establish a stable post mine topography that blends into the undisturbed areas outside the mining limits (Map 19C). Colowyo will grade all final slopes so that overall grades do not exceed 3H:1V (Map 20C).

As described on Map 29B, backfilling and grading activities are scheduled to be completed in the Little Collom X pit area not impacted by the development of the temporary overburden stockpile, approximately five years after initial mining begins. Map 23B describes the anticipated mining progression in the Little Collom X pit. Immediate backfilling of the Little Collom X pit is precluded by the potential for highwall mining resource opportunities in this location (not currently shown or sought at this point in time) in addition to the initial center boxcut location serving as a significant interception point for runoff and snowmelt collection during the initial boxcut development of both proposed pits.

Where necessary, the regraded spoil surface will be roughened by ripping or discing etc., to ensure a bond between the topsoil and spoil to reduce slippage. To date there is no evidence of topsoil slippage on reclaimed areas in the existing permit area. A few small tension cracks resulting from settling of fill and topsoil have occurred in a few areas within a year or two after reclamation, but soon stabilize and begin to fill in.

The final surface as shown on the Post-mining Topography Map (Map 19C) will approximate the overall pre-mining grades (Map 19D). Appropriate cross sections that show the anticipated final surface configuration of the proposed permit area, in conjunction with the existing pre-mining topography, are shown on the Pre-mining and Post-mining Cross Section (Map 20C).

The regrading plan reestablishes 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.

Topsoil will be removed prior to the mining disturbance according to the timetable established on the Topsoil Handling Map (Map 28C). As can be observed from this map, the initial topsoil removed at the operation must be stockpiled; however, as the operation progresses, topsoil can be immediately redistributed rather than stockpiled.

Revegetation will commence as soon as the topsoil has been redistributed and prepared for seeding as described in Section 2.05.4. The area will be seeded with the seed mixture described in Section 2.05.4 as quickly as possible, typically in the fall of each year following topsoil placement activities.

4.14 BACKFILLING AND GRADING

4.14.1 General Requirements

The mining operations of Colowyo will not employ the use of contour mining methods.

The original permit demonstrates that Colowyo does not have thin or thick overburden as defined in Subsection 4.14.4 or Subsection 4.14.5. There is always more than enough overburden to reestablish the original elevation.

The mining plan, as described in Section 2.05.3, maximizes coal conservation and recovery while minimizing adverse environmental impacts. Because of the mining configuration planned by Colowyo, an exemption from the 180 day or four spoil ridge limitations has been formally requested. The mining plan has been designed as a continuously-moving open pit operation with the mine advancing in the up dip (north to south) direction. The mining operation will progress in a southward direction with shovels/trucks proceeding along the entire length of the mining area (Map 23B). With the numerous benches used in an open pit operation, the mine area will be opened for some time until the equipment comes back to initiate another pass on a designated bench.

As the mining operations remove coal seams, the mining area must be left open until such time as the lower-most coal seam can be recovered. With the mining configuration, the time differences between mining the upper-most seam versus the lower-most seam may be greater than 180 days. As the operation advances, backfilling will be as contemporaneous as practical but not so as to interfere with removal of the lower-most coal seam. Colowyo will rough backfill and grade as shown on the Map 29B – Spoil Grading. All disturbed areas may be returned to the appropriate final contour by grading and backfilling with the use of a dragline, trucks, dozers, and scrapers. Additional detail of the backfilling and grading for the mining operation is set forth in the discussion under Sections 2.05.3 and 2.05.4.

The area to be mined will be restored to a topography approximating pre-mining grades. The slopes of backfilled areas, as necessary, will utilize contour furrows for erosion control and stability. These contour furrows will be constructed according to the requirements outlined in Section 2.06.2. Where applicable, Colowyo will retain all overburden and spoil on the solid portion of existing benches. The final graded slopes will not exceed the approximate original pre-mining slope grade as shown on the Map 19C – Post Mining Topography. Table 2.05.6-5 presents a mine-wide volumetric calculation in support of the Post Mining Topography. Post-mining surface drainage channels will be located to minimize erosion and to minimize slippage.

4.14.2 General Grading Requirements

The final graded slopes at the mining operation will not exceed the approximate original pre-mining slope grade as shown on Map 19C. Colowyo will retain all overburden and spoil material on solid portions of existing or new benches. The final bench at the terminus of the operation will be eliminated by backfilling overburden into the final pit area.

Small depressions of a holding capacity slightly greater than one cubic yard of water may be used to create a moist micro climate to aid in shrub establishment. See Section 2.05.4, Planting and Seeding Methods for further information regarding these small depressions. Colowyo will not be mining on any slopes above 20° as shown on Map 18B – Pre Mining Topography.

Final grading before topsoil placement will be conducted in a manner that minimizes erosion and provides a surface for the topsoil that minimizes slippage. Final grading will be accomplished so that overall grades will not exceed lv:3h. The plan for backfilling and grading is shown graphically on the Map 29B.

4.14.3 Covering Coal and Acid and Toxic Forming Materials

Colowyo will not have any exposed coal seams remaining at the end of mining and reclamation. Colowyo does not have any acid forming materials at the mine. For discussion on acid and toxic-forming materials, refer to Section 2.04.6. For disposal of non-coal wastes or materials constituting a fire hazard, refer to Section 4.11.4.

4.14.4 Thin Overburden

Colowyo does not have a thin overburden situation as defined in Section 4.14.4 of the regulations.

4.14.5 Thick Overburden

Colowyo does not have a thick overburden situation as defined in Section 4.14.5 of the regulations.

4.14.6 Re-grading or Stabilizing Rills and Gullies

This section will remain unchanged from the previously-approved permit document.

4.15 REVEGETATION REQUIREMENTS

4.15.1 – 4.15.7 Revegetation Requirements, Various

General Requirements

Colowyo will establish on all affected land within the Collom mine plan area a diverse, effective and permanent vegetative cover of the same seasonal variety as that native to the area. Vegetative cover will be comprised of native species that are desirable and necessary to achieve the approved postmining land uses as required under Section 4.15.2 (with modest exceptions). Seed mixtures, revegetation metrics, and bond release protocols designed to target specific post-mining land use components are presented within the context of this section (4.15) as well as the reclamation plan, Section 2.05.4

The details of the revegetation plan are discussed in Section 2.05.4.

Vegetation Monitoring

Please review Volume 1, Section 4.15.1(4) to review the interim revegetation monitoring program activities and process to be applied to the Collom mining area. Colowyo is proposing no changes to the program specific to the Collom mining area.

Use of Introduced Species

For Collom area revegetation, the seed mix is comprised entirely of native species with the specific exceptions described below. Introduced species would only be utilized in four possible circumstances. The first would be reclaimed areas exhibiting a post-mining land use of pastureland (specifically targeting domestic livestock grazing and/or haying operations). The second would be in small areas potentially susceptible to excessive erosion where at the discretion of Colowyo's reclamation coordinator, introduced species would provide the necessary protection. (Prior to use of introduced species to combat areas that are highly susceptible to erosion, an MR or TR (as appropriate) will be obtained from CDRMS to address such circumstances.) The third possible circumstance would be the inclusion of orchard grass at elevated densities in certain locations designed to encourage elk away from other sites. (It has been documented that elk specifically seek this species for consumption.) The fourth circumstance would be inclusion of modest quantities of small burnett or nitrogen fixing legumes such as cicer milkvetch or alfalfa as supplemental forage for deer, elk, and livestock. In addition, cicer milkvetch has proven to be an excellent "habitat" plant for insects that are very important to foraging sage grouse chicks during the brooding period.

Seeding and Planting

The seeding and planting of the disturbed area will be conducted during the first normal period for favorable planting conditions after final preparation for seeding or planting. The planting period and other revegetation metrics for Colowyo are set forth in Section 2.05.4.

Mulching and Other Soil Stabilizing Practices

As addressed in Section 2.05.4, when necessary, chisel plowing, discing, terracing and/or contour furrows could/would be utilized to stabilize, reduce compaction and increase the moisture retention of graded topsoiled areas. Chisel plowing is the most preferred method of initiating surface roughness at Colowyo, beyond the roughness created through topsoil laydown activities. Areas less than 10% slope in the Collom mining area have been identified as potentially targeted areas for the Sagebrush Steppe land use and will essentially require a smooth seedbed surface. If these Sagebrush Steppe areas occur in large patches in the future and encompass long sweeping slopes, moderate contour furrows will be established to mitigate any future sheet flow and loss of the topsoil resource. Efforts will be made to establish reclamation blocks along the contour of slopes in order to eliminate the loss of the topsoil resource onto spoil areas. All other areas targeted for the grassland subcomponent of the Rangeland land use will generally be on slopes greater than 10% and depending on the size of each reclamation unit will need to be chisel plowed (or ripped with a dozer) at a minimum if topsoil laydown activities do not produce sufficient surface roughness to limit the excessive formation of rills on first and second year reclamation blocks by "normal" seasonal runoff events. Contour furrows will be created with regular frequency on slopes greater than 20% and less frequently on areas between 10% and 20% slopes depending on the length of the slope and the size of individual reclamation blocks as determined by topsoil laydown progression in any given year or series of years. As indicated under "Mulching Techniques" in Section 2.05.4, use of mulch would be considered a last resort, but is certainly an erosion control metric that may be utilized (where deemed necessary) for long south-facing slopes. Spoil will be graded to minimize long, uninterrupted slopes. Replacement of topsoil will be followed by chisel plowing and contour furrowing (when necessary).

The efficacy of these mechanical techniques will continue to be closely monitored as changes to the reclamation program are initiated.

Grazing

All the lands reclaimed by Colowyo in the Collom area will not be grazed by livestock for a period of at least three years after seeding or planting and will be managed to promote the postmining land use.

Grazing by livestock will not commence until Colowyo has demonstrated to the satisfaction of the Division that the vegetation on the reclaimed surface is adequately established and can be expected to withstand grazing pressures. Any grazing studies undertaken by Colowyo will not preclude or interfere with postmining vegetation sampling as required in section 4.15.8.

Field Trials

Please refer to Volume 1, Section 4.15.6 for more details on specific field trials that have occurred on the existing permit area in the past.

Given the fact the post-mine land use, reclamation plan, and mitigation efforts will focus on sagegrouse brood-rearing habitat in conjunction with grassland, Colowyo is not in favor of large scale "restoration" activities associated with mountain shrub communities beyond the inclusion of many of the species of concern within the reclamation seed mixes. However, Colowyo has accommodated CDOW's request to incorporate approximately 750 small size enclosures into Collom reclamation areas on 150 acres at a density of approximately five enclosures per acre to meet their expectations for establishing tall shrub species. Colowyo has a long history of supporting scientific research through cooperative field trials involving the academic community, the Division, and other area mining operations. Colowyo has made many unsuccessful attempts to establish tall shrub communities, despite the utilization of the best technology of the time. Efforts undertaken to date include everything up to and including live transplantation of local mature plants, containerized plantings, direct drill and broadcast seedings. The two field trials described below are meant to provide additional information to Colowyo, DRMS and the CDOW about the appropriate expectations for success/failure of establishing this habitat type at Colowyo in the context of a ten year bond clock and also to provide some baseline information that can be used to modify practices and the plant materials used to assist efforts to establish this habitat type in the future. The standard interim revegetation monitoring techniques and practices (performed by a third party) applied to the other reclamation areas at Colowyo will be utilized annually to measure progress of the trials. All data will be captured, collated and presented as part of the Annual Reclamation Report provided to DRMS.

A full description of both proposed field trials is as follows:

1) Colowyo agrees to establish one small (one acre) tall shrub establishment site that that displays a thicker topsoil condition. The location of this field trial will likely be located in the Grassland designated seeding area as illustrated by Map 46. Actual results from the trial should yield information that can be used to apply additional stability and/or sediment control measures on larger areas if this attempt is successful.

    a) The area will be regraded in accordance with PMT requirements.

    b) The area will be tested for overburden suitability as per requirements.

    c) Approximately 48 inches of topsoil will be placed to replicate common topsoil depth conditions in the surrounding area in stands of this nature. Once the topsoil has been placed, it will be cross-ripped with a dozer or by other appropriate means to ensure the material is in a loose, rough condition to encourage infiltration of rain/snowmelt an root development.

d) The Sagebrush Steppe mix has been modified to reduce the volume of "low shrubs" in favor of tall shrub components of the mix. The grasses currently included in the mix were also reduced to minimize competition, while still providing some soil stabilization function. The entire trial area will be seeded with the modified Sagebrush Steppe Mix as seen below. In the event individual components of the mix are unavailable, guidance from the Division will be sought prior to implementation of the trial. Weedguard fabric or its equivalent will be placed in rows (at intervals of approximately 22 feet) and will be used to severely reduce competition between the containerized plantings and annual weeds and grasses. Please see the "Expected Field Implementation Plan for Tall Shrub Field Trials" illustration below.

e) Containerized 2-3 foot serviceberry and chokecherry plants will be utilized from the most similar source elevation available in the region. Based on the volume of containerized plants included in the trial (550), a combined number of (300) serviceberry and chokecherry plants within the trial (five years after implementation) will be considered a successful demonstration of Colowyo's ability to establish these species. Supplemental planting of serviceberry and chokecherry should be initiated the year following initial trial establishment should initial survival of the plantings be very low.

f) Containerized serviceberry and chokecherry plants will be placed through the weed barrier fabric by hand (or by mechanical means if practical and economically feasible) as per best practices with regards to depth, etc. Proper planting holes are important in transplant survival. Holes should be two to three times wider than the root ball. If the soil is clay and the sides of the hole become glazed during digging, the sides of the hole should be roughened with a spade. Holes should be prewatered before planting in dry soils. This prevents initial postplant water from migrating away from the root ball. Every effort will be made to plant at the same depth that the tree or shrub was growing in its previous location. Damaged roots will be clean-cut with a sharp blade prior to planting. If any circling or kinked roots are discovered during the transplanting procedure, they will be severed to prevent future girdling of the plant. Every effort will be made to orient the tree or shrub in the same direction, relative to the sun, as it was facing in the previous location. Plantings will be performed in the fall by properly trained personnel. Serviceberry and chokecherry planting densities will be one plant every four linear feet (1/2 serviceberry, 1/2 chokecherry) within a row.

g) Colowyo will place contour furrows immediately above approximately every third fabric row (approximately every 66 feet). The trial will exhibit alternating bands of modified Sagebrush Steppe mix (approximately 17 feet), fabric/containerized plantings (4-5 feet wide), modified Sagebrush Steppe mix (approximately 12 feet), contour furrow (approximately 5 feet). This pattern should allow for specific emphasis on containerized plantings establishment while minimizing the risk of excessive erosion during the period of early establishment of the trial area.

h) An "elk proof" exclusionary fence will be erected around the perimeter of the trial area to protect it from ungulates immediately after planting activities are completed.

i) In the event of stand failure the area will revert back to sagebrush steppe for the purposes of Phase III bond release in the future, and will be counted collectively with other sagebrush steppe areas to meet sample adequacy and reference area comparisons.

2) Colowyo agrees to establish one small (one acre) tall shrub establishment site that that displays thin topsoil conditions. The location of this field trial will be along the transition zone between Sagebrush Steppe and Grassland designated seeding areas (likely between 10% and 15% slope as illustrated by Map 46).

a) The area will be regraded in accordance with PMT requirements. Additional ripping of the overburden material will be conducted by a dozer to a depth of approximately four feet to ensure the material is in a loose condition, rough condition to encourage infiltration of rain/snowmelt and root development. Overburden with a significant course fragment component is desirable.

b) The area will be tested for overburden suitability as per requirements.

c) An approximate average of four inches of topsoil will be placed to replicate common topsoil depth conditions in the surrounding area in stands of this nature. Once the topsoil has been placed, it will be roughened with a disc (pulled by a dozer or other appropriate machine) to ensure the material is in a loose, rough condition to encourage infiltration of rain/snowmelt and root development.

d) The Sagebrush Steppe mix will be modified to reduce the volume of "low shrubs" in favor of tall shrub components of the mix. The grasses currently included in the mix will also be reduced to minimize competition, while still providing some soil stabilization function. The entire trial area will be seeded with the modified Sagebrush Steppe Mix as seen below. In the event individual components of the mix are unavailable, guidance from the Division will be sought prior to implementation of the trial. Weedguard fabric or its equivalent will be placed in rows (at intervals of approximately 22 feet) and will be used to severely reduce competition between the containerized plantings and annual weeds and grasses. Please see the "Expected Field Implementation Plan for Tall Shrub Field Trials" illustration below.

e) Containerized 2-3 foot serviceberry and mahogany plants will be utilized from the most similar source elevation available in the region. Based on the volume of containerized plants included in the trial (550), a combined number of (300) serviceberry and mahogany plants within the trial (five years after implementation) will be considered a successful demonstration of Colowyo's ability to establish these species. Supplemental planting of serviceberry and mahogany should be initiated the year following initial trial establishment should initial survival of the plantings be very low.

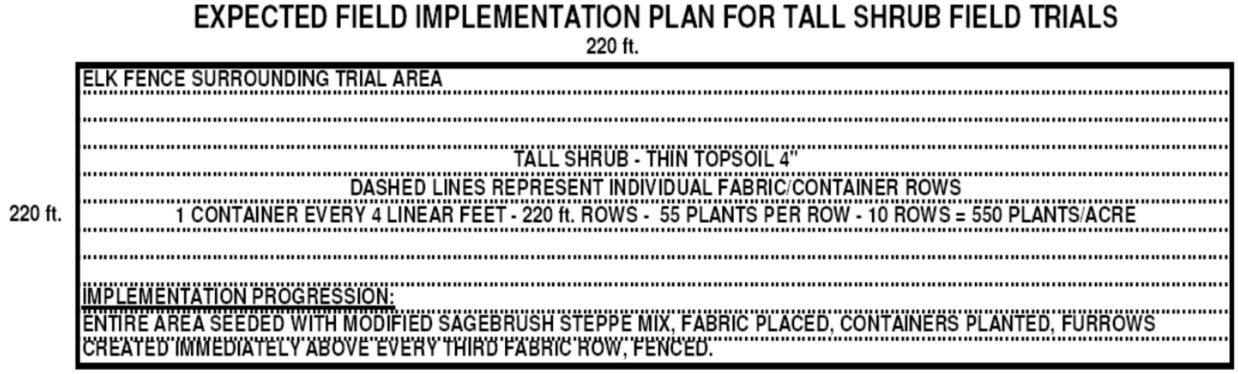
f) Containerized serviceberry and mahogany plants will be placed through the weed barrier fabric by hand (or by mechanical means if practical and economically feasible) as per best practices with regards to depth, etc. Proper planting holes are important in transplant survival. Holes should be two to three times wider than the root ball. If the soil is clay and the sides of the hole become glazed during digging, the sides of the hole should be roughened with a spade. Holes should be prewatered before planting in dry soils. This prevents initial postplant water from migrating away from the root ball. Every effort will be made to plant at the same depth that the tree or shrub was growing in its previous location. Damaged roots will be clean-cut with a sharp blade prior to planting. If any circling or kinked roots are discovered during the transplanting procedure, they will be severed to prevent future girdling of the plant. Every effort will be made to orient the tree or shrub in the same direction, relative to the sun, as it was facing in the previous location. Plantings will be performed in the fall by properly trained personnel. Serviceberry and mahogany planting densities will be one plant every four linear feet (1/2 serviceberry, 1/2 mahogany) within a row.

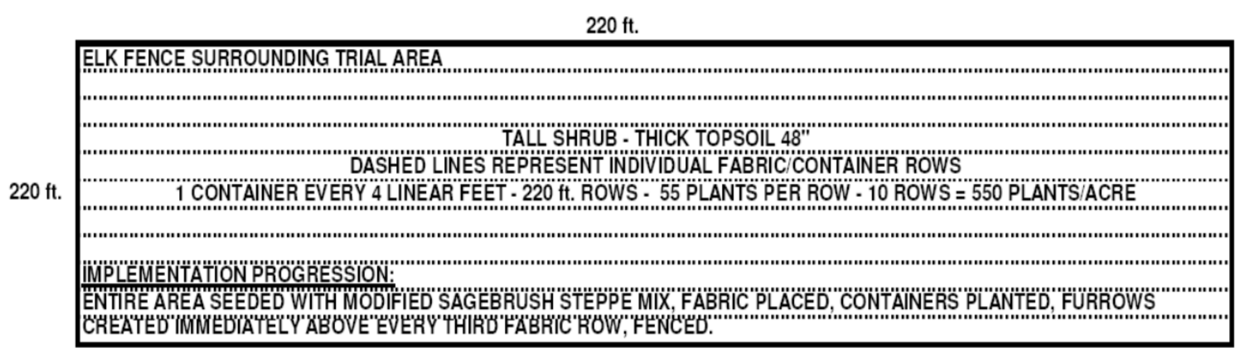
g) Colowyo will place contour furrows immediately above approximately every third fabric row (approximately every 66 feet). The trial will exhibit alternating bands of modified Sagebrush Steppe mix (approximately 17 feet), fabric/containerized plantings (4-5 feet wide), modified Sagebrush Steppe mix (approximately 12 feet), contour furrow (approximately 5 feet). This pattern should allow for specific emphasis on containerized plantings establishment while minimizing the risk of excessive erosion during the period of early establishment of the trial area.

h) An "elk proof" exclusionary fence will be erected around the perimeter of the trial area to protect it from ungulates immediately after planting activities are completed.

i) In the event of stand failure the area will revert back to sagebrush steppe for the purposes of Phase III bond release in the future, and will be counted collectively with other sagebrush steppe areas to meet sample adequacy and reference area comparisons.

EXPECTED FIELD IMPLEMENTATION PLAN FOR TALL SHRUB FIELD TRIALS





TALL SHRUB FIELD TRIALS MODIFIED SAGEBRUSH STEPPE MIX				
Preferred application method is with a Trillion or similar seeder. Species that are problematic for drill seeding will be broadcast.				
Species Name	**Common Name**	**Origin**	**Life Form**	**Rec. PLS lbs / acre**
Agropyron spicatum inerme	Beardless Bluebunch Wheatgrass	N	Grass	0.50
Agropyron trachycaulum	Slender Wheatgrass	N	Grass	0.20
Bromus marginatus	Mountain Brome	N	Grass	0.30
Elymus cinereus	Great Basin Wildrye	N	Grass	0.20
Stipa viridula	Green Needlegrass	N	Grass	0.20
Poa ampla	Big Bluegrass	N	Grass	0.20
Festuca saximontana	Rocky Mountain Fescue	N	Grass	0.20
			Grass Subtotal =	1.80
Artemesia ludoviciana	Louisiana Sagewort	N	Forb	0.50
Vicia americanus	American Vetch	N	Forb	0.30
Linium lewisii	Lewis Flax	N	Forb	0.20
Achillea millifolium	Western Yarrow	N	Forb	0.10
Penstemon palmeri	Palmer Penstemon	N	Forb	0.10
Penstemon strictus	Rocky Mountain Penstemon	N	Forb	0.20
			Forb Subtotal =	1.40
Pursia tridentata	Bitterbrush	N	Shrub	1.50
Rosa woodsii	Wood's Rose	N	Shrub	0.50
Symphoricarpos rotundifolius	Mountain Snowberry	N	Shrub	1.50
Artemesia tridentata vaseyana	Mountain Big Sagebrush	N	Shrub	0.25
Chrysothanmus nauseosus	Rubber Rabbitbrush	N	Shrub	0.15
Amelanchier utahensisa	Utah Serviceberry	N	Shrub	1.20
Amelanchier alnifoliaac	Saskatoon Serviceberry	N	Shrub	1.20
Prunus virginiana melanocarpa	Chokecherry	N	Shrub	1.20
Acer glabrum	Rocky Mountain Maple	N	Shrub	1.20
Cercocarpus ledifolius	Curlleaf Mountain Mahogony	N	Shrub	1.20
Cercocarpus montanus	True Mountain Mahogony	N	Shrub	1.20
			Shrub Subtotal =	11.10
			Complete Mix Total =	14.30
NOTE: ACTUAL IMPLEMENTED MIX MAY VARY BASED ON AVAILABILITY OF SPECIES LISTED. CDRMS WILL BE PROVIDED WITH AN AMMENDED MIX FOR REVIEW AND APPROVAL SHOULD ANY CHANGES BE REQUIRED PRIOR TO IMPLEMENTATION OF THE TRIALS				

4.15.7 Determining Revegetation Success: General Requirements and Standards

During the summer of 2005, reference areas were selected to represent vegetative communities in the Collom mining area. The locations of these reference areas are shown on the Vegetation map (Map 4C – Sheet 1). Extensive, detailed vegetative sampling was performed, duplicating the methodologies as described in Section 2.04.10.

The reference areas were sampled for herbaceous cover, herbaceous production and woody plant density. Species diversity was determined utilizing herbaceous cover data from the premining inventory. The reference areas vary in size between 27.7 and 79.5 acres (Table 2.04.10-33)

Statistical tests were performed on the vegetative data from the reference areas to prove that they were comparable to the premined area. The parameters compared were herbaceous cover and herbaceous production.

Sample size adequacy tests were performed on both the premine and reference area data to insure that representative cover and production data had been obtained at the 90% level of confidence.

Where necessary, the mean, variance and number of observations for the premine and reference area data were used to perform t-tests on the cover and production data to insure that there were no significant differences, at the 90% level of confidence, between the sets of cover data and production data.

A copy of the transect data summaries for cover, production and woody plant density can be found in Exhibit 10, Item 6.

Currently the reference areas are located in an area where grazing can be managed in accordance with the approved postmining land use.

1. Comparisons of weighted averages between reference areas and revegetated areas under Subsection 4.15.7(4) (b) and Subsection 4.15.11 may be utilized to determine revegetation success. Similar methodologies and statistical tests used to compare premine and reference areas will be used to compare reference areas and revegetated areas. For weighted comparisons of Collom area revegetation, reclaimed area data will be compared against 39% of the Mountain Shrub Reference Area, 47% of the Sagebrush Reference Area, and 14% of the Grassland Reference Area data.

For demonstration of revegetation success, vegetation cover, herbaceous production, and in certain circumstances woody plant density will be sampled to statistical adequacy (where necessary), and compared to the approved standard or reference area mean. The Division has completed a comprehensive bond release guideline (1995) that provides a good overview of recommended sampling approaches, statistical adequacy formulas and statistical tests. Furthermore, new regulations promulgated 9/14/05 under Section 4.15.11 detail new allowable approaches for vegetation sampling and testing. Colowyo will utilize procedures recommended in the new regulations, guideline, or other procedures that are as effective as the Division's recommendations. Before Colowyo begins a vegetation sampling program for bond release, the Division will be consulted to confirm sampling approaches and statistical testing. A base level or initial protocol is detailed under Section 4.15.11 below.

As indicated in Rule 4.15.7 (5) the 10-year liability period will begin following the last year of augmented seeding, fertilization, irrigation, or related revegetation work. To facilitate bond release, revegetation success criteria must be met for two of the last four years of the liability period excepting that sampling for final success determination cannot occur prior to year 9 of this period (unless these rules are changed to be less restrictive by the Division). The liability period will be re-initiated for augmentation work excepting work associated with normal management activities as defined under Rule 4.15.7 (5) (a-g). This allows the liability period to remain unchanged for such revegetation metrics as "interseeding" (4.15.7 (5)(g)) of additional grasses and forbs into a stand targeting shrubs to increase cover values of these life forms.

To summarize the use of reference areas in this testing process, the following will occur. There are three reference areas (RAs) that will be utilized for testing against reclamation on the Collom mining area. These reference areas are: Mountain Shrub RA, Sagebrush RA, and Grassland RA. All grasslands (grasslands) reclaimed on the Collom mining area shall be compared to weighted parameters from the Mountain Shrub RA (39% weight), the Sagebrush RA (47% weight) and Grassland RA (14% weight) in accordance with 4.15.7(4)(b). All Collom mining area reclaimed lands that evolve into a Sagebrush Steppe community* will be directly compared to the Sagebrush RA.

* Areas that evolve into a sagebrush steppe community cannot be determined with certainty until several years following seeding, emergence, and maturation of shrubs. Emergence of this community may occur in both areas where sagebrush steppe is targeted as well as those grassland targeted areas that receive significant sagebrush seed. Any sagebrush steppe that evolves in either of these areas will be delineated with GPS techniques, sampled accordingly, and tested against the Sagebrush RA at

4.15.8 Revegetation Success Criteria

Colowyo will meet the requirements of this Subsection to insure that the post-mining vegetation in the Collom mining area will be adequate for final bond release. As delineated under Subsections 4.15.7 and 2.05.4, Colowyo will utilize established reference areas (see Section 4.15.7 above) for the purpose of comparing vegetation information between the reclaimed area and the undisturbed area for the variables of ground cover and production. For the variables of woody plant density and species diversity, Colowyo shall compare revegetated area parameters against defined standards detailed later in this section. Data to be used in these comparisons must be from statistically adequate sampling (where necessary) as indicated in Rule 4.15.11. In instances where grassland targeted reclamation areas exhibit the characteristics of the sagebrush steppe areas and can meet the release standards for core or ecotonal sagebrush steppe, Colowyo will seek release and credit for the creation of those areas towards fulfillment of the minimum habitat development requirement (350 acres). In the unlikely but not impossible event that areas targeted for sagebrush steppe display community characteristics that will not meet the sagebrush steepe area release criteria but do for the grassland criteria, Colowyo will designate those acres as grassland. Colowyo will have to specifically designate the location of both grassland and sagebrush steppe areas prior to the initiation of phase III bond release data collection. For descriptive purposes, "evolved" sagebrush steppe areas refer to lands originally seeded to grassland that exhibit sufficient community characteristics of the sagebrush steppe community to be fully released as either core or ecotonal areas. Areas defined as "targeted" sagebrush steppe are by definition the areas originally seeded to the sagebrush steppe plant community that exhibit the characteristics of that community and meet either the core or ecotonal requirement for full release.

Herbaceous Cover

For revegetation <u>targeting (and achieving) the land use subcomponent of grassland</u>, herbaceous cover of the revegetated area will be considered adequate for final bond release if it is not less than 90% of the herbaceous cover as determined from the reference areas with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means. As allowed under the rules promulgated on 9/14/05, these comparisons may utilize one of three methods detailed under Rule 4.15.11 (2) [(a), (b) or (c)]. Also as allowed by Rule 4.15.7 (4), either weighted-average or individual protocols will be followed depending on the resulting community that evolves (see Section 4.15.7 above). For grassland testing the weighted average approach (Rule 4.15.7 (4) (b)) will be utilized where reference area data and revegetated area data are "weighted" (each combined into single values for comparison) based on the proportional acreage of pre-mine communities within the disturbance area footprint. Testing will then follow procedures detailed under Rule 4.15.11 (2) with preference being given first to subsection (a) [direct comparison], second to subsection (c) [reverse-null testing], and third subsection (b) [classic *t*-test].

For "targeted" sagebrush steppe revegetation (<u>targeting the land use subcomponent of wildlife habitat</u>), herbaceous cover will be considered adequate for final bond release if it is not less

the time Phase III Bond Release measurements begin.

than 70%* of the sagebrush reference area's herbaceous cover with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means. If necessary, a reverse-null hypothesis testing procedure may be utilized in accordance with procedures detailed in Rule 4.15.11 (2) (c). As allowed under Rule 4.15.8 (3) (ii), relaxation of the herbaceous cover standard for areas targeting wildlife habitat post-mining land uses is designed to compensate for revegetation techniques (prescribed ecological reclamation approach) that must discourage grasses to encourage shrubs in the post-revegetated community. For "evolved" sagebrush steppe revegetation, the grassland cover standard will be maintained.

A higher percentage of herbaceous cover is not practical or desirable for the following reasons:

1. It is well documented that in mined-land reclamation the establishment of shrubs to reach bond release levels has proven to be very difficult. Perhaps the most detrimental condition affecting shrub establishment is the competition from herbaceous vegetation. At a minimum herbaceous cover levels should be less than the premining condition. If the herbaceous levels to be obtained were set higher than the premining condition, the ability to achieve bond release levels for shrubs would be most adversely affected. Higher levels of herbaceous cover would adversely compete against woody vegetation and hinder its successful establishment.

2. In mined-land reclamation it is important to have adequate herbaceous cover to provide for erosion control. The reference areas for the Collom mining area indicate herbaceous cover values of 62.75%, 51.00% and 51.85% for the mountain shrub, sagebrush and grassland references respectively.

   The period of highest potential erosion occurs in the springtime during snowmelt. At this time of year, erosion control is provided almost exclusively by herbaceous vegetation. Erosion control by shrub cover is virtually insignificant since the potential erosion occurs from snowmelt rather than raindrop impact. Therefore, if pre-mining levels of herbaceous vegetative cover can be re-established, logically a comparable level of erosion control will be achieved.

3. The ability to achieve adequate levels of herbaceous cover in the Collom mining area is, without question, quite possible. The vegetative monitoring completed at Colowyo during the last three decades, and summarized in Annual Reports, indicates that the premining levels of herbaceous cover are easily achieved.

   In fact, the vegetative data as summarized in the Various Annual Reports indicate that the levels of herbaceous cover on the reclaimed areas may have exceeded the premine condition by 30% to 50%.

   The vegetative sampling serves to confirm what can be observed in the field. The revegetation at Colowyo is excellent and there is virtually no evidence of erosion attributable to a lack of cover. In fact the herbaceous cover existing at Colowyo meets

*The value of 70% has been selected given the following rationale: 1) herbaceous competition must be significantly restricted to facilitate emergence and growth of shrubs as indicated under Rule 4.15.11 (3) (ii); 2) the original value is 90%; 3) a value of 50% seems too low to adequately control erosion; 4) by regulation (4.15.11 (3)(a)) a reduction to 70% is allowed for one of the demonstrations for revegetation success for woody plant density; and 5) 70% of the herbaceous material in a native reference area should be adequate to control erosion on slopes 10% or less.

or exceeds the premining condition and is undoubtedly providing significant competition with the woody specie seedlings. There is certainly no evidence that herbaceous cover values on the reclaimed areas should be set higher than the herbaceous cover of the premine areas in order to achieve bond release.

Herbaceous Production

For revegetation (targeting (and achieving) the land use subcomponent of grassland), herbaceous production of the revegetated area will be considered adequate for final bond release if it is not less than 90% of the herbaceous production, as determined from the reference areas with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means. As allowed under the rules promulgated on 9/14/05, these comparisons may utilize one of three methods detailed under Rule 4.15.11 (2) [(a), (b) or (c)]. As allowed by Rule 4.15.7 (4), either weighted-average or individual protocols will be followed. For grassland testing the weighted average approach (Rule 4.15.7 (4) (b)) will be utilized where reference area data and revegetated area data are "weighted" (each combined into single values for comparison) based on the proportional acreage of pre-mine communities within the disturbance area footprint. Testing will then follow procedures detailed under Rule 4.15.11 (2) with preference being given first to subsection (a) [direct comparison], second to subsection (c) [reverse-null testing], and third subsection (b) [classic t-test].

For areas designated as sagebrush steppe revegetation (land use subcomponent of wildlife habitat), herbaceous production success criteria will be eliminated as a requirement should CDRMS rules change as expected in the near future. In the meantime, for sagebrush steppe revegetation, herbaceous production of the revegetated area will be considered adequate for final bond release if it is not less than 70% of the herbaceous production as determined from the reference areas with a 90% statistical confidence utilizing a standard student's statistical t-test comparison of the means. If necessary, a reverse-null hypothesis testing procedure may be utilized in accordance with procedures detailed in Rule 4.15.11 (2) (c). As inferred under Rule 4.15.8 (3) (ii), relaxation of the herbaceous production standard for areas targeting wildlife habitat post-mining land uses is designed to compensate for revegetation techniques (prescribed ecological reclamation approach) that must discourage grasses to encourage shrubs in the post-revegetated community. Justifications for reduction to 70% are identical to those presented for cover in the previous section.

Woody Plant Density

As alluded to under the cover and production success criteria, a new revegetation plan utilizing a "prescribed ecological reclamation approach" (PERA) has been adopted for the Collom mining area operation that will facilitate the creation of wildlife habitat conducive vegetation communities (sagebrush steppe), hence revegetation will be subject to a different set of success criteria for bond release. In this regard, the following discussion lays some of the foundation of the underlying principals of this approach to provide a basis for development of the success standards.

Revegetation will specifically target livestock grazing and sage grouse brood rearing habitat. Both of these, in combination, are the two primary components of the joint Post-mining Rangeland/Fish and Wildlife Habitat Land Use. Collom mining areas designed to target livestock grazing (with benefits to wildlife populations) will comprise approximately 60% to 80% of the reclaimed landscapes. These areas will principally occupy more steeply sloping ground (>10%)

where the grassland community is necessary to preclude excessive erosion, especially from snowmelt. Based on evaluation of the post-mining topography, the remaining approximately 37% (Map 19D) of the reclaimed landscape will afford flat or gently sloping surfaces (<10%) with reduced exposure to erosion. It is on the majority of these less exposed more gentle slopes whereby development of wildlife conducive habitats (sagebrush steppe) can be attempted (only on larger blocks of land - e.g., >5 acres) without overly compromising stability. In this regard, sagebrush communities targeting sage grouse brood-rearing habitat will be attempted in earnest on approximately 30% (or more) of the Collom mining area reclaimed landscape, with the goal of achieving success on at least one-half of this acreage or as otherwise agreed upon between Colowyo and CDRMS (Please see Map 46 for specific areas proposed for the sagebrush steppe and grassland plant communities).

The principal basis of PERA is to rebuild the foundation conditions of target vegetation communities taking into account the appropriate aspects, slopes, and topographic features of the reclaimed landscape. In this manner, targeted communities, as opposed to more simple grasslands will be more strongly encouraged. Potential reclamation techniques to be applied to facilitate the targeting of sagebrush communities include, but are not limited to: 1) taking advantage of site-specific opportunities for development of convex and concave surfaces to encourage snow entrapment; 2) development of small berms along the contour and somewhat perpendicular to prevailing winds, also to encourage snow entrapment; 3) use of native species; 4) <u>severe</u> reduction of grasses in the seed mix; 5) use of only bunch grasses for those taxa planted with sagebrush; 6) sharp increases in the amount of sagebrush seed to be used; 7) extra care to obtain the correct subspecies of sagebrush (*vaseyana-pauciflora*) with a seed source as close as possible to the Axial Basin; 8) extra care to place seed at the ideal time of year (immediately prior to the first major snowfall event; 9) placement of thin layers of topsoil over overburden; 10) possible placement of zero topsoil; 11) possible placement of thin layers of overburden over topsoil; 12) use of specialized seed placement equipment to obtain correct planting depths; 13) use of seedbed preparation equipment and techniques to encourage sagebrush emergence; and 14) interseeding of additional grasses and/or forbs (only where necessary) following a period of 2 – 3 years of growth by shrubs. All of these possible techniques / metrics are designed to diminish the competitive advantage of grasses, at least in the early stages of establishment and growth. The primary "foundation-building" element for this approach is the ability to replace variable topsoil depths and/or quality of soil materials depending on site-specific needs, the discretion of the field construction supervisor, and the capabilities (or lack thereof) of available materials and equipment.

In summary, application of PERA on "shrub-favorable areas" would be based on the community development contributory factors of: 1) soil quantity, quality, and replacement depth; 2) aspect, slope, and landform; 3) documented and expected performance of various floral species; 4) revegetation metrics; and 5) the target post-mining land use. In this manner, reclamation and resultant developing communities will be encouraged to follow a more natural path to maturation and successional progression as opposed to more historically utilized grassland favorable approaches that should only be applied to the remaining 60% to 80% of reclaimed ground (sloping areas). However, there will likely be instances, if not an overall need, to incorporate managerial practices to encourage or protect positive recruitment to the shrub populations. Such management may include the following steps:

- Use of elevated quantities of sagebrush seed within the grassland target areas, and placement of that seed in a manner to encourage sagebrush emergence.

- Use of limited livestock (cattle) grazing to select against grasses and for shrubs and forbs.
- Use of elk-proof fencing to preclude access into large blocks of maturing shrub populations, especially core areas.
- Use of hunting pressure to reduce elk utilization of new reclamation where it can be incorporated in a safe manner given proximity to active mining. Develop special seasons in concert with CDOW for management of "refuge" elk. For obvious reasons, any activity in this regard would have to be designed and approved for implementation in accordance with applicable statutes. Furthermore, approvals from appropriate agencies (CDOW, MSHA, etc.) will be obtained as necessary.
- Use of orchard grass (*Dactylis glomerata*) in key reclamation locations to encourage elk away from maturing shrub populations. It has been documented that this taxon is heavily utilized by foraging elk.
- Implement procedures for micro-habitat development whereby snow catchment is encouraged and shrub heavy mixes can be applied.
- Interseeding of shrubs (as necessary as a normal husbandry practice) within areas not exhibiting satisfactory establishment of shrubs, but still presenting opportunities (micro-niches) for shrubs. Such interseeding would be performed in accordance with Rule 4.15.7(5)(g), and documentation of any such efforts would be provided in the Annual Reclamation Report for that year.

This Collom mining area reclamation plan, includes management and revegetation specifications (e.g., shrub species in the seed mix) for use on the "grassland" targeted areas that will facilitate additional shrub establishment when climatic or other conditions are favorable. In this manner, small and/or scattered patches of additional shrubland may be established that will provide improved habitat diversity for all wildlife species, especially for sage grouse. However, since this type of reclamation is entirely dependent on the vagaries of nature, dependence upon such techniques cannot be relied upon.

Where shrublands evolve on these "sagebrush community attempts", they will be segregated into "core" areas and "ecotonal" areas (as is typically evident in nature), each with a separate woody plant density success criterion. Furthermore, it has been noted repeatedly in the industry that the 10-year bond responsibility period is insufficient for the adequate development of shrub populations. In this regard, flexibility must be built into the success evaluation process (and/or criteria) so that if a positive recruitment rate to the shrub population can be documented on Colowyo revegetation, there would be no need to achieve elevated densities within a modest time-frame such as the 10-year responsibility period.

Given these points, the following woody plant density success criteria will be applied to Collom mining area revegetation efforts: On grassland communities (approximately 60% to 80% of reclaimed acreage (>10% slope) targeting the post-mining land use of grazing-land), zero woody plant density will be required. However, if shrub communities evolve in these areas this acreage will count toward the wildlife habitat acreage and be subject to the appropriate standards. On identified manifested shrublands, the post-mining land use goal of wildlife habitat – sage grouse brooding habitat, the following criteria will be applied depending on shrubland classification. On "core areas" (areas of shrub concentration and comprising no less than one-half the minimum total shrubland acreage), the eventual desirable goal shall be 1000 plants per acre, but the standard shall be 500 live plants per acre. At least one-half of these totals shall be sagebrush species. In "ecotonal areas" the eventual desirable goal shall be 500 plants per acre, but the standard shall be 375 plants per acre. The 500 and 375 plants per acre standards translate to approximately one plant for each 8' x 8' or 13.5' x 13.5' area, respectively. Furthermore, Colowyo makes the commitment to establish sagebrush steppe (comprised of both core and ecotonal areas) on approximately 350 acres of the Collom mining area reclamation. This acreage is based on the following rationale: 1) delineation of all Collom mining area post-mining acreage exhibiting slopes 10% or flatter; 2) elimination of all small, isolated, or impractical areas for targeting this community; 3) implementing "banding" (alternating strips of grassland versus shrubland) procedures on large units with long slopes that might otherwise lead to excessive "snowmelt" erosion; and 4) assuming 50% shrub establishment success on the acreage that actually receives shrub conducive metrics.

Issues with the potential longterm longevity of fourwing saltbush will require that a maximum proportion of the countable shrubs used to demonstrate conformance with the applicable performance standards be limited to 20%. As an example, should an area demonstrate 500 live shrub plants per acre, 400 of those plants must be something other than fourwing saltbush. Colowyo believes that on-site research partially refutes the data collected at other locations with respect to fourwing saltbush longevity but has compromised in this case given the concerns raised by the Division during the permitting of the South Taylor mining area.

Diversity

CDRMS regulations have been revised to allow for the use of comparisons of species composition based on cover between the reclaimed area and the undisturbed vegetation.

This method of analyzing diversity was applied to the premine herbaceous vegetation cover data originally sampled and summarized in Table 2.04.10-35 (Collom – Vegetation Cover – 2005 Diversity Summary).

Species diversity for the postmine vegetative community will be determined in the same manner as the premine inventory. Cover data will be collected using a point frame placed in an unbiased manner. Overall, postmine data collection methods will be similar to premine data collection methods. Relative cover values (composition) will be determined for each species in the sampled portion of the reclaimed area.

The revegetation objective for diversity will be to establish a community on the reclaimed areas that contain the following;

For areas exhibiting the characteristics of the grassland subcomponent of the Rangeland/Fish and Wildlife Habitat Land Use:

a) At least three native[*] cool season perennial grasses with between 3% and 50% relative cover (composition), and

[*] The limitation to "native" status will not apply to introduced (and CDRMS approved) taxa specifically planted for an approved use (such as Orchard grass or Cicer milkvetch).

b) At least one perennial forb or shrub with between 2% and 50% relative cover (composition), or

c) A total of all forbs or all shrubs combined with between 4% and 50% relative cover (composition), or

d) If five or more native* cool season perennial grass taxa contribute between 3% and 50% composition, the requirement for perennial forbs and shrubs shall be limited to 1% or more relative cover combined.

For areas exhibiting the characteristics of the sagebrush steppe subcomponent of the Rangeland/Fish and Wildlife Habitat Land Use.

At least four native* perennial species, each more than 3% composition, minimum of two of which are grasses and a minimum of one which is a forb, with the following caveat;

If no single forb species exceeds 3% composition, the forb requirement can be met if:

a) at least two native* perennial forbs combined comprise at least 2% composition, or;

b) at least four native* perennial forbs combined comprise at least 1% composition.

The dominant species will contribute to the appropriate structure and stability of the postmining vegetative community to insure that the postmining land use as addressed in Section 4.16, Post-mining Land Use, will be sustained.

The seed mixtures in Volume 15, Table's 2.05-7 and 2.05-9 contain the desired species to achieve the goal of species diversity in the postmining area as applicability to future reclamation activities in the Collom mining area were a consideration when they were developed. These mixtures contain grasses, forbs and shrubs capable of establishing vegetative communities that are capable of supporting the desired postmining land use. The existing seed mixes are also appropriate based on nearly identical elevation, precipitation, soils, vegetation community structure and function, and pre-mine land use characteristics as were observed in the existing operation.

4.15.9 Cropland Revegetation Success

Colowyo does not plan to return any of the mined area for use as cropland; therefore, the requirements of this Subsection are not applicable to Colowyo.

4.15.10 Previously Mined Land Revegetation Success Criteria

Revegetation success criteria established in 4.15.8 shall be used across the entire Collom Lite and Little Collom X pits.

* The limitation to "native" status will not apply to introduced (and CDRMS approved) taxa specifically planted for an approved use (such as Orchard grass or Cicer milkvetch).

4.15.11 Revegetation Sampling Methods and Statistical Demonstrations for Revegetation Success Revegetation Community Mapping / Stratification

Unless new, CDRMS approved, and superior monitoring and sampling metrics are developed, the following metrics will be implemented at Colowyo to document revegetation progress and success.

During monitoring of revegetated units, developing shrub patches will be identified and as necessary delineated (circumnavigated with a sub-meter GPS unit to document boundaries) to facilitate mapping that in turn will represent the juxtaposition (stratification) of developing communities. As indicated previously, delineated shrub patches will be classified as either "core" areas or "ecotonal" areas depending on apparent density of developing shrub populations. Such stratification is necessary as success criteria associated with areas of wildlife habitat will be applicable to shrub-dominated communities as opposed to grassland success criteria applicable to remaining revegetation efforts targeting livestock grazing land uses (with wildlife habitat benefits).

Sample Layout

The sample layout protocol for revegetation monitoring and bond release evaluations shall be a systematic procedure designed to better account for the heterogeneous expression of seedings within reclaimed areas while precluding bias in the sample site selection process. By design, the procedure is initiated randomly, and thereafter, samples are located in a systematic manner, along grid coordinates spaced at fixed distances, e.g. 200 ft. In this manner, "representation" from across the target reclamation unit is "forced" rather than risking the chance that significant pockets are entirely missed, or overemphasized as often occurs with simple random sampling.

Older reclaimed units (e.g., 7+ years) shall receive a minimum of 20 ground cover transects and in monitoring areas – co-located shrub density belts. Production for monitoring purposes shall be collected from a representative five of these 20 sample points. For bond release efforts, production will be collected from a statistically adequate sample as defined below. Monitoring efforts for younger reclaimed units (e.g., 2 to 4 years) shall receive 15 transects and co-located woody density belts (as necessary) but no production sampling. First year units will receive one cluster of five emergent density quadrats spread in a representative manner for approximately every two acres of reclamation. For units 50 acres or larger, a five-quadrat cluster should be collected from every 4 acres of reclamation. With regard to any two-year old or older reclamation unit that is smaller than about 3 acres, the number of samples (for monitoring) shall be limited to five.

The systematic procedure for sample location in revegetated units shall occur in the following stepwise manner. First, a fixed point of reference (e.g., fence corner) will be selected for the target unit to facilitate location of the systematic grid in the field. Second, a systematic grid of appropriate dimensions will be selected to provide a reasonable number of coordinate intersections (e.g., 5, 15, 20, etc.) that would then be used for the set of sample sites. Third, a scaled representation of the grid will be overlain on a computer-generated map of the target unit extending along north/south and east/west lines. Fourth, the initial placement of this grid will be implemented by selection of two random numbers (an X and Y distance) to be used for locating a systematic coordinate from the fixed point of reference, thereby making the effort unbiased. Fifth, where an excess number of potential sample points (grid intersections) is indicated by overlain maps, the excess may be randomly chosen for elimination. (If later determined that additional samples are needed, the eliminated potential sample sites would be added back in reverse order until enough samples can be collected.) Sixth, using a handheld compass and pacing techniques, or a hand-held GPS, sample points will be located in the field.

Once a selected grid (sample) point is located in the field, sampling metrics will be utilized in a consistent and uniform manner. In this regard, ground cover sampling transects will always be oriented in the direction of the next site to be physically sampled to further limit any potential bias while facilitating sampling efficiency. Depending on logistics, timing, and access points to a target sampling area, the field crew may occasionally layout a set of points along coordinates in one direction and then sample them in reverse order. However, orientation protocol will always be maintained (i.e. in the direction of the next point to be physically sampled). If the boundary of an area is encountered before reaching the full length of a transect, the transect orientation will be turned 90o in the appropriate direction so the transect will be completed within the target unit. In this manner, edge transects will be retained entirely within the target unit by "bouncing" off the boundaries. Production quadrats will always be oriented 90o to the right (clockwise) of the ground cover transect and placed one meter from the starting point so as to avoid any trampled vegetation. Woody plant density belts (for monitoring efforts) will be extended parallel to the ground cover transects for a distance of 50 meters and width of 2 meters. (If the grid distance is less than 50 meters, density belts will be reconfigured to be 4 m X 25 m or similar configuration, but always totaling 100 m^2.)

Determination of Ground Cover

Ground cover at each sampling site will be determined utilizing the point-intercept methodology. This methodology will be applied as follows: First, a transect 10 meters in length will be extended from the starting point of each sample site toward the direction of the next site to be sampled. Then, at each one-meter interval along the transect, a "laser point bar", "optical point bar" or 10-point frame will be situated vertically above the ground surface, and a set of 10 readings recorded as to hits on vegetation (by species), litter, rock (>2mm), or bare soil. Hits will be determined at each meter interval as follows:

1. When a laser point bar is used, a battery of 10 specialized lasers situated along the bar at 10-centimeter intervals will be activated and the variable intercepted by each of the narrow (0.02") focused beams will be recorded;

2. If an optical point bar is used, intercepts will be recorded based on the item intercepted by fine crosshairs situated within each of 10 optical scopes located at 10-centimeter intervals.

3. If a 10-point frame is used, sharpened pins will be used to determine intercepts at 10-centimeter intervals. Care will be taken to NOT record "side touches" on the pins as this will result in a significant overestimation error.

The following sampling rules should apply during data collection. Intercepts will be recorded for the first (typically highest) current annual (alive during the current growing season) plant part intercepted without regard to underlying intercepts or attachment to a living base except when multiple strata are present. In this circumstance, multiple live hits may be recorded, but only one hit per stratum with the second live hit being recorded separately and not used to calculate total ground cover. Otherwise, the intercept will be litter, rock or bare soil. Rock intercepts are based on a particle size of 2 mm or larger (NRCS definition), otherwise it would be classified as bare soil. To distinguish between current year senescent plant material and litter (including standing dead), the following rule should apply: 1) if the material is gray or faded tan it should be considered litter; and 2) if the material is bright yellow or beige it should be considered current annual (alive) and recorded by species. On occasion, experience with non-conforming taxa may override this rule.

When using laser or optic instruments during windy field conditions, the observer should consistently utilize one of the following techniques for determining a hit: 1) record the first item focused upon that is intercepted by the narrow laser beam or cross-hair; 2) wait a few moments and record the item intercepted for the longest time, or 3) block the wind and record the intercept. When using a pin frame, the observer must wait for the wind to subside.

With regard to gaps in the overstory, the point-intercept procedure naturally corrects for overestimations created by 2-dimensional areal (quadrat) or 1-dimensional linear (line-intercept) techniques. In this regard, the 0-dimensional point is extended along a line-of-sight until it "intercepts" something that is then recorded. Frequently points simply pass through overstory gaps until a lower plant part, litter, rock or bare soil is encountered.

Regardless of instrument, a total of 100 intercepts per transect will be recorded resulting in 1 percent cover per intercept. This methodology and instrumentation (excepting the 10-point frame) facilitates the collection of the most unbiased, repeatable, precise, and cost-effective ground cover data possible. Identification and nomenclature of plant species should follow Weber and Wittman (1996) Colorado Flora: Western Slope or newer text.

Determination of Production

Where production samples are to be collected (7+ year-old units or Bond Release units) current annual herbaceous production will be collected from a $^1/_2$ m^2 quadrat frame placed one meter and 90° to the right (clockwise) of the ground cover transect to facilitate avoidance of vegetation trampled by investigators during sample site location. If more production samples are necessary than cover samples (typical case for bond release efforts), orientation protocol will be maintained except that no ground cover data will be collected. From within each quadrat, all above ground current annual herbaceous vegetation within the vertical boundaries of the frame will be clipped and bagged separately by life form as follows:

Perennial Grass	Perennial Forb
Annual Grass	*Annual Forb*
Subshrub	*Noxious Weeds (if found)*

All production samples will be returned to the lab for drying and weighing. Drying will occur at 105° C until a stable weight is achieved (24 hours). Samples will then be re-weighed to the nearest 0.1 gram.

Determination of Woody Plant Density

Two sampling methods may be employed for monitoring woody plant density within Colowyo's revegetated units. The first method, belt transects, may be employed when the size of the monitoring unit exceeds one to two acres. At each sample site in such areas, a 2-meter wide by 50-meter long belt transect (or alternately 4 x 25 meter transect) should be established parallel to the ground cover transect and in the direction of the next sampling point. All woody plants (shrubs and trees) within each belt will be enumerated by species. Determination of whether or not a plant may be counted is dependent upon the location of its main stem or root collar where it exits the ground surface with regard to belt limits. A total of 5, 15 or 20 belt transects may be sampled for each monitoring unit.

For bond release sampling with belts, sufficient samples must be collected to insure adequacy of the effort (to facilitate valid testing) in accordance with one of the three methods under either Rule 4.15.11 (2), or Rule 4.15.11 (3). Depending on the selected protocol, care must be taken to collect at least the minimum number of samples indicated (15, 30, 40, or 75, depending on the procedure utilized).

The second method, total enumeration, may be employed for monitoring when the size of a unit is less than approximately one to two acres in size. Total enumeration shall be the typical method utilized for bond release purposes unless shrub patches are too large (e.g., greater than 10 to 15 acres) to practically utilize this technique (in which case belts will be utilized). This method involves total counts of woody plant populations as opposed to estimates of mean densities through statistical sampling. Implementation of the total count technique would involve circumscribing the boundaries of a target polygon with hip chain thread or similar visible designation. Once a unit is circumscribed in this manner, a team of two or more biologists walking shoulder-to-shoulder traverse the plot enumerating each plant by species. The person farthest inside the line of observers trails hip chain thread, or other means, to mark their path to prevent missing or double counting specimens on subsequent passes. The distance between observers should be 15 to 20 feet or less depending on the height of grasses and the presence of low growing taxa such as rose or snowberry. Each internal observer should also "zigzag" as the team progresses, occasionally turning to view the area just passed to ensure visual coverage of the entire survey path. Constant communication among crew members precludes double counting or missing of plants located along the margins of observed paths. Results from total enumeration efforts can be compared directly with success criteria without statistical testing.

Determination of Seedling Emergence

At each emergent density sample point (revegetation monitoring only), five one-square foot quadrats should be blindly tossed to the ground and the number of emergents rooted within the perimeter of each shall be recorded accordingly into one of five classes: perennial grass, perennial forb, shrub, annual grass, or annual forb. Where possible recognizable taxa may be recorded by species. Efforts with 1 – 2 perennial emergents per ft^2 are considered to be fair, 2-3 perennial emergents per ft^2 are considered to be good, while 3-4 perennial emergents per ft^2 are considered very good. Five or more perennial emergents per ft^2 are considered to be excellent.

Sample Adequacy Determination

Sampling within each monitored unit shall be conducted to a minimum of 5, 15 or 20 samples as necessary. Sampling within each unit under consideration for bond release shall start with a minimum of 15 (reference area) or 20 samples (revegetated area) and continue until a statistically adequate sample (if necessary) has been obtained in accordance with Section 4.15.11 (2) (a). From initial sampling efforts, sample means and standard deviations for total non-overlapping vegetation ground cover, production, and woody plant density will be calculated.

For bond release applications, the typical procedure is that sampling continues until an adequate sample, $\mathbf{n_{min}}$, has been collected in accordance with the Cochran formula (below) for determining sample adequacy, whereby the population is estimated to within 10% of the true mean (μ) with 90% confidence. For woody plant density, the estimate is to within 15% of the true mean.

When the inequality ($\mathbf{n_{min} \leq n}$) is true, sampling is deemed adequate; and $\mathbf{n_{min}}$ is determined as follows:

$$\boxed{\mathbf{n_{min} = (t^2\, s^2) / (d\,\bar{x}\;)^2}}$$

where: n = the number of actual samples collected (initial size = 15 or 20)

t = the value from the one-tailed *t* distribution for 90% confidence with n-1 degrees of freedom (a value of approximately 1.3);

s^2 = the variance of the estimate as calculated from the initial samples;

d = precision (0.10 for cover and production or 0.15 for woody plant density;

$\bar{x}$ = the mean of the estimate as calculated from the initial samples.

If the initial samples do not provide a suitable estimate of the mean (i.e., the inequality is false), additional samples should be collected until the inequality ($\mathbf{n_{min} \leq n}$) becomes true. However, where sampling is for managerial (monitoring) information, adequacy is not necessary and is calculated for informational purposes only.

If reverse-null testing will be utilized to document success, then in accordance with Rule 4.15.11 (2) (c) a minimum of 30 samples must be collected and a demonstration of sample adequacy is not necessary. In this circumstance a two-sample reverse null t-test is mandated along with Satterthwaite approximated degrees of freedom and standard error. However, if an adequate sample can be obtained from the reference area, then a less complex one-sample t-test may be utilized. With the reverse null test, the smaller the variance (given by extra sampling) the better the chances of passing closely matched parameters.

For certain statistical demonstrations of woody plant density, documentation of sampling adequacy is often problematic, hence Rule 4.15.11 (3) may be used in lieu of Rule 4.15.11 (2). Rule 4.15.11 (3) (a) is a reverse-null approach based on the median and requires a minimum of 30 samples. Rule 4.15.11 (3) (b) allows direct comparison with standards if a statistically adequate sample cannot be demonstrated in accordance with Rule 4.15.11 (2) (a), however, a minimum of 75 samples with a minimum quadrat size of 100 m^2 is required (equivalent to total enumeration of 1.85 acres). Rule 4.15.11 (3) (c) is a standard-null approach based on determination of a "running mean" and a minimum of 40 samples is required.

Success Evaluation

To summarize, success evaluations involve either a direct or a statistical *t*-test comparison of appropriate parameters for each variable of interest (cover, production, diversity, or woody plant density). For monitoring efforts, comparisons shall be made directly with either the reference area parameters or the permitted standards to facilitate a determination of the progress of revegetation. In the case of ground cover and production, comparisons shall be made against reference area data of the same year. Diversity and woody plant density variables shall be compared against the standards defined above.

For bond release efforts, direct comparisons are made when the revegetated area mean value for a given variable is greater than either 90% of the standard or the reference area mean assuming that a statistically adequate sample has been collected. If a statistically adequate sample cannot be obtained, a "reverse-null" hypothesis test may be employed as detailed in C.R.S. Rule 4.15.11 (2) (c). If an adequate sample is obtained for a particular variable, but the mean is less than 90% of the reference area mean or standard, a "standard-null" hypothesis *t*-test may be employed as detailed in C.R.S. Rule 4.15.11 (2) (b).

For the typically problematic variable of woody plant density, Colorado has implemented three alternate adequacy / success evaluation methods under C.R.S. Rule 4.15.11 (3) that may be utilized in lieu of those detailed under 4.15.11 (2). Until experience dictates which procedure is best (because these are relatively new metrics to the science), it would be prudent to collect a minimum of 75 belt transects (at least 100 m^2 in size) as indicated in 4.15.11 (3)(b)(i). These data can then be used for the various analyses / comparisons.

4.16 POSTMINING LAND USE

4.16.1 General

Implementation of the detailed reclamation plan as presented in Section 2.05.4 will result in a landscape and vegetative cover that is equal to or better than the pre-mining condition for Rangeland/Fish and Wildlife use that currently exists in the area.

4.16.2 Determining Use of Land

The pre-mining land uses for the mine and adjacent areas are shown on Map 17. Map 17 serves to identify both the pre and post-mine land use designations. Colowyo is focused on re-establishment of the joint land use of Rangeland/Fish and Wildlife Habitat post-mining. The narrative describing the land use of the Collom permit area is presented under Sections 2.04.3 and 2.05.5. The proposed post-mining land use will involve restoration to the pre-mining land use of Rangeland/Fish and Wildlife Habitat (grassland and sagebrush steppe), as described in Section 2.05.5. The land management staff of Colowyo, the BLM and the State Land Board fully support Colowyo's approach to the re-establishment and enhancement of multiple-use Rangeland/Fish and Wildlife Habitat focused on improved range condition and the creation of wildlife habitat specific to sagegrouse brood-rearing. Copies of the correspondence confirming these views have been included in this package and are identified as Figures 2.05.5-1, 2.05.5-2 and 2.05.5-3.

4.16.3 Alternative Land Uses

The joint land use of Rangeland/Fish and Wildlife Habitat will be restored in a timely manner as outlined in Section 2.05.4. No alternative land uses will be implemented in the reclamation plan set forth under Section 2.05.4.

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Appendix B

CDRMS Approved Project Design Features and Permit Stipulations for Alternative A the Proposed Action and Revisions Proposed for Alternative B

I. CDRMS Approved Project Design Features and Permit Stipulations Attached to the Approved SMCRA Permit for Alternative A, the Proposed Action

A. Introduction

The Project design features below were originally proposed by Colowyo and subsequently approved by CDRMS during the SMCRA permitting process for the Colowyo Mine. The permit stipulations were added by CDRMS as permit requirements. The design features and stipulations are excerpted directly from Colowyo's approved PAP, Volume 15, Rule 2, Permits, and Rule 4, Performance Standards, and Permit Revision – 03, Approved by CDRMS 05/29/2013. In the event that on the ground conditions encountered, or other relevant factors are different from those originally anticipated that were the reason for a specific design feature, there are regulatory processes in place for CDRMS and OSMRE to consider approval of modifications to the mitigation measures.

B. Project Design Features Excerpted from the Approved PAP and SMCRA Permit Stipulations Excerpted from Approved PR 03

2.05.4 (2)(f-h) Disposal, Mine Openings, Water and Air Control

Acid-Forming and Toxic-Forming Materials

No significant acid-forming materials exist within the overburden soil or coal seams to be mined. Therefore, Colowyo will not undertake special handling procedures as described in Section 2:05.3. A detailed description of the chemical characteristics of soils and overburden materials is presented under Sections 2.04.6 and 2.04.9.

For a detailed description of the special handling of spoil material and sampling programs, refer to the Production Methods and Equipment Segment of this section.

Flammable liquids, such as oil and fuel, will be protected from spilling into other areas by earthen, concrete or HDPE lined structures surrounding each storage facility. A spill containment control plan protect against spills will be available to the Division to review prior to final approval of PR 03.

All major equipment on the Collom area mine operation will be equipped with portable fire extinguishers or automatic fire suppression systems. The water trucks used for dust suppression at this location could also be used to control most fires.

Sealing of Exploration and Mine Holes

Exploration and mine holes which remain open for use as a water supply well or for use as a groundwater monitoring well will be completed with casing or piezometers at sufficient height above the land surface to prevent drainage of surface water or entrance of foreign material into the well, and will be fitted with caps to prevent the introduction of objects other than monitoring and sampling equipment. When the groundwater monitoring wells are no longer needed or required for any purpose, each well will be eliminated by plugging with concrete to the surface and removal of the associated surface structure.

Plugging procedures utilized for exploration drill holes that will not be mined through during the current Permit term are as follows:

1. Drill holes drilled deeper than the stripping limit (450-500 feet) will be plugged by pumping cement or heavy solids bentonite Plug Gel or chips through the drill stem from the bottom up to within 3 feet of the ground surface.
2. Drill holes shallower than stripping limits (450-500 feet) may be plugged with the ready-mix concrete method instead the method in #1 to within 3 feet of the ground surface.
3. Drill holes with no water or coal zones may be plugged by backfilling with cuttings, and placing a plug ten feet below the ground surface to support a cement plug or bentonite chips to within 3 feet of the ground surface.

For safety considerations, exploration drill holes that will eventually be mined through during the present Permit term need only be covered with wood, plastic or other such material or otherwise bermed to prevent access.

Those holes completed in aquifers will be sealed entirely with cement or other suitable sealant to within 3 feet of the ground surface.

Where possible, the sealed holes will be marked. At times reclamation operations will cover up the sealed drill holes and marking of holes will not be possible.

Within 60 days of the abandonment of a drill hole, approved drilling program or when requested by the Division, the following information will be submitted:

a) Location of drill hole as plotted accurately on a topographic map.

b) Depth of drill hole.

c) Surface elevation of drill hole.

d) Intervals where water was encountered during drilling activities.

e) Diameter of drill hole

f) Type of amount of cement or other sealant used.

g) Name of drilling contractor and license number of rig.

h) How the hole was worked.

Exploration taking place inside and outside of the permit area will be handled through the Notice of Intent (NOI) procedures. See the appropriate NOI for details for each program.

Water and Air Quality Control Techniques

Steps to be taken to comply with the Clean Water Act and other applicable water quality laws and regulations and health and safety standards include a comprehensive drainage and sediment control plan described in Section 2.05.3 and Sections 4.05.1 through 4.05.18. With respect to compliance with the Clean Water Act, Colowyo has a discharge permit from the Colorado State Department of Health under the National Pollutant and Discharge Elimination System (NPDES) that will include all new discharge structures constructed for the Collom area expansion. Compliance with this permit will serve to effect compliance with the Clean Water Act and the Colorado Water Quality Control Act.

Colowyo, likewise, operates under several emission permits from the Colorado Department of Health, Air Pollution Control Division. Fugitive dust control measures will be employed as an integral part of the mining and reclamation operations.

Colowyo conducts air quality monitoring at the site in accordance with the requirements of emission permits approved by the Colorado Air Pollution Control Division.

Details of pollution control measures are discussed in section 2.05.6.

2.05.5 Post-Mining Land Uses

Historically, the Collom area has been managed utilizing the principles of multiple-use and can be most accurately described as rangeland/fish and wildlife habitat. Map 17 serves to identify both the pre and post-mine land use designations. Colowyo is focused on re-establishment of the joint land use of rangeland/fish and wildlife habitat post-mining. The land management staff of Colowyo, the BLM, and the Colorado State Land Board fully support Colowyo's approach to the re-establishment and enhancement of multiple-use rangeland/fish and wildlife habitat focused on improved range condition and the creation of wildlife habitat specific to greater sage grouse (GRSG) brood-rearing. Copies of the correspondence confirming these views have been included in this package and are identified as Figures 2.05.5-1, 2.05.5-2 and 2.05.5-3 respectively. Much of the lower portions of the Collom area receive light to moderate grazing pressure primarily from cattle but also some use by sheep herds. These lower elevations also provide seasonal transition (migratory) habitat for big game, but more importantly offer breeding and brooding habitat to indigenous GRSG and sharp-tailed grouse populations. The higher elevations receive slight to light grazing pressure from cattle, but more typically light to moderate grazing pressure from sheep herds. These higher elevations also provide Spring and Summer habitat for big game, especially local elk herds (Exhibit 10 Item 6).

Based on site-specific observations, water source distribution, occupied habitats, forage availability, land forms, distribution of vegetation communities, and similar landscape features and ecological characteristics, the split between the dominant land use sub-components would appear to be 80-90 percent livestock and 10-20 percent wildlife (Exhibit 10 Item 6). It is suspected that the economic impact of these two land-use sub-components would also reflect this approximate split. As these subcomponents are not exclusive (areas utilized by livestock for grazing also serve as wildlife habitat and vice-versa) the overall goal is to promote the use of seed mixes that provide benefits for both land uses. In recent years, much of the Collom area, especially western portions, has been managed under the Morgan Creek Ranching for Wildlife program, where livestock grazing utilization levels and timing have been modified to increase the quality and quantity of resident deer and elk populations for hunting. This program has also included the development of watering sources (stock tanks) and prescribed burns aimed at reducing the extent of over mature sagebrush stands and introducing a mosaic of young sagebrush and grassland communities. Given this active management for wildlife, it can be hypothesized that the split between land use sub-components is probably closer to 80/20 as opposed to 90/10, livestock grazing to wildlife habitat, respectively. The overall goal of the reclamation program is to increase the value of the areas disturbed by mining activities for both livestock grazing and wildlife habitat through increased forage production, improved plant community diversity and a greater emphasis on the establishment of sagebrush and other forb/shrub species across the area.

The implementation of the detailed reclamation plan as contained in Section 2.05.4 will restore the disturbed land to the pre-mining use of rangeland/fish and wildlife habitat. The joint land uses of rangeland/fish and wildlife habitat are comprised of the two primary subcomponents "livestock grazing or grassland" and "wildlife habitat or GRSG brood rearing habitat". Replacement of grassland will be facilitated by targeting revegetation efforts toward grassland communities with a significant effort made to establish forb/shrub species (especially sagebrush) to promote dual utilization from wildlife. Because grasslands are effective for erosion control, this community will be implemented on those lands with slopes greater than 10 percent. Replacement of wildlife habitat (GRSG brood rearing habitat) will be facilitated by targeting revegetation efforts toward the re-establishment of a sagebrush steppe community. Because sagebrush steppe is less able to preclude erosion, it will be limited to those lands with slopes less than 10 percent. Furthermore, certain small areas with slopes flatter than 10 percent will receive grassland targeted efforts for reasons given in Section 2.05.4.

These land use subcomponents will be specifically accomplished by the regrading of spoil in compliance with the approved post mine topography, restoration of drainage patterns, and reapplication of the topsoil followed by seeding of the appropriate seed mixture for the designated land use subcomponents (Please see Map 46 for proposed areas of focus for receiving the sagebrush steppe or grassland seed mixes). Erosion will be controlled on the newly seeded areas through the use of contour furrows, terraces, banding, and/or other metrics until the vegetation has sufficiently established. The lands will also be protected from noxious weeds or other biological processes such as cattle grazing until the stands are sufficiently established to support grazing pressure.

The proposed post-mine land use of rangeland/fish and wildlife habitat for the reclaimed areas is identical to the pre-mining land use found in the area. Colowyo owns all but approximately 3,262 acres (2,525 of which is Bureau of Land Management land and 637 is State Land) of the land within the proposed Collom area expansion (approximately 16,833 acres). No change in land use is expected in the proposed land use categories. Therefore, the proposed post mine land use will be consistent with the historic land use on lands within the proposed Collom expansion area.

The consideration of a joint post-mining land use of rangeland/fish and wildlife habitat is identical to the discussion in Section 2.04.3. The limitations on changing to an alternative land use are fully discussed in that Section.

Domestic livestock grazing will not commence until at least three years after seeding and shall be managed to promote the post-mining land use. Grazing will be managed in such a manner so as to not interfere or preclude the post-mining vegetation sampling as required in Section 4.15.8. It should be noted that grazing will likely not occur until areas receive full bond release due to safety concerns regarding livestock and non-miners near active operations.

2.05.6 Mitigation of Surface Mining Operation Impacts Air Pollution Control Plan

2.05.6 (1) Air Pollution Control Plan

Air quality will be protected in accordance with the procedures outlined in the existing permit document. These procedures are currently employed at the existing mining area. Air quality information is included in Exhibit 8 of the existing permit document. The final air pollution control plan is in development pending the collection of new meteorological parameters necessary for modeling.

Colowyo maintains fugitive dust control measures as an integral part of all mining and reclamation activities. Presently, Colowyo operates under numerous Emission Permits issued from the Colorado Department of Health, Air Pollution Control Division, as more particularly described in Section 2.03.10. Colowyo conducts air quality monitoring at the site in accordance with the requirements of the emission permits.

The principal fugitive dust control practices employed by Colowyo are as follows:

Roads

Colowyo will employ a dust suppression program for in pit roads and other unpaved roads which primarily involves periodic watering. Mine water trucks will run periodically as needed over the roads wetting down any dusty conditions. During the dryer months of the year, the water trucks will wet down the roads which are being utilized a minimum of two or three times per shift. If determined to be necessary as an addition to periodic watering, a chemical dust suppression agent may be used during the dry months on the primary in pit roads. To this date, however, chemical stabilization of the unpaved in pit roads at the existing operation have not been successful for more than a short period of time due to changing weather conditions and the use of heavy haulage trucks.

Colowyo has surfaced "in-pit" roads with gravel or crushed rock; however, no roads in the Collom area pits will be paved with asphalt. Asphalt could not sustain the enormous weights of the haulage equipment currently in use. Likewise, crawler equipment would rip the asphalt surface causing an extremely hazardous condition for all equipment and personnel. All roads in the mining operation will be constantly maintained by a motor grader, scraper, or rubber tired dozer to remove any coal, rock, or any other debris. Smooth and clean road surfaces are essential for not only minimizing dust, but also for allowing efficient, safe and economic use of haulage equipment.

The coal haul road from the Collom area primary crusher to the Gossard Loadout is planned to be paved with asphalt to provide for emission control.

A strict speed control will be implemented for all roads to control dust and to provide for safe operation of the equipment.

Out of pit haul road embankment slopes and adjacent areas will be mechanically stabilized and seeded with a mixture shown in Volume 15, Section 4.03.1-4.03.2. Mechanical stabilization has consisted of furrowing, chiseling, "cat tracking" and mulch, depending on accessibility to the slopes.

No travel of unauthorized vehicles will be allowed on anything other than established roads. All overburden haulage equipment will be restricted only to appropriate roads.

Colowyo does not plan to cover any of the haul trucks because the roundtrip between the coal crushing facility and the active mining area will be relatively short, and the loaded trucks will be moving slowly. Also, care will be taken by the front-end loader or shovel operators not to overfill any of the haul trucks so as to cause excessive fugitive dust.

Coal Crushing Facility

Coal will be hauled from the various mining areas in haulage trucks to the primary crusher facility as shown on the Map 22B. Following primary crushing, the coal is hauled to the Gossard Loadout facility, as shown on the Existing Structures - North Map (Map 21).

The coal crushing and conveying operations at the primary crusher and the Gossard Loadout will be equipped with a water-spraying system at all coal transfer points. A four-sided enclosure-bas-been will be installed on the truck dump at the primary crusher to prevent excessive dust emissions. The secondary crusher at the Gossard Loadout has a bag house 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. The air quality control measures at the coal crushing handling and loadout facilities have been approved by the Colorado Department of Health, Air Pollution Control Division.

Colowyo will maintain a several acre area for coal storage near the primary crusher and also near the Gossard Loadout. Inactive storage piles will be sloped and compacted to prevent wind erosion and spontaneous combustion. If coal dust becomes troublesome in the active coal storage piles, a mobile water truck with a high pressure pump and nozzle is available for dust suppression.

No thermal dryers will be used in the coal crushing and handling facilities.

Disturbance

Colowyo, as much as is practical, minimizes the area of land disturbed at any one time. Topsoil will be removed only to the extent necessary to accommodate the mining operations. Through the mine plan, the rehandling of both topsoil and overburden is kept to a minimum. Reclamation of disturbed areas will commence as contemporaneously as possible.

As necessary, a mobile water truck will be assigned to work in topsoil or overburden removal operations to keep any dusty conditions under control. Planting of special windbreak vegetation in the permit area is not planned.

Blasting

Sequential blasting is utilized as a standard practice to reduce the amount of unconfined particulate matter produced.

Complete blasting information is set forth in Section 2.05.3 and Sections 4.08.1 through 4.08.6.

Protection of Public Parks and Historical Places

No public parks are located within the proposed revised permit area or adjacent areas; therefore, no public parks will be affected by the proposed mining operations. Likewise, the proposed mining operations will not affect any places included on or eligible for listing in the National Register of Historical Places.

Surface Mining near Underground Mining

No surface mining activities within the permit area will be conducted within 500 feet of an underground mine.

2.05.6 (2) Fish and Wildlife Plan

Prior to and during the early years of mining, Colowyo implemented wildlife management and range management programs to offset the potential impacts of mining on wildlife and to improve the rangeland in surrounding areas which had deteriorated after years of overgrazing. Other protection measures were also implemented to minimize any possible effects of the increased mining activity.

Also, during the early stages of pre-planning for the mining operation, Colowyo adopted a policy to return the land to a condition capable of supporting the diverse wildlife populations that the area currently supports. The assumption in the late 1970s was that shrub reestablishment would play a key role in wildlife habitat mitigation. These early efforts were unique in that revegetation with shrub species, especially native shrub species, had never been an integral part of pre-mine planning in the West. Virtually no information was available and very little was known about the growth requirements of native species. To reach these early objectives, Colowyo implemented revegetation and wildlife habitat use studies designed to determine the feasibility and techniques of revegetating disturbed areas with native shrub vegetation adapted to northwest Colorado. However, after decades of experience, it has become obvious that reestablishment of shrubs on the reclaimed area is not critical to encourage wildlife use such as by elk, deer and pronghorn.

For example, in recent years it has been observed that elk herds of between 200 and 400 animals utilize the reclaimed grasslands of the mine as foraging habitat. These numbers increase to between 2000 and 4000 animals during the hunting season and then slowly drop off as the snow depths increase and the elk herds migrate to lower elevations. The animals return in the

Spring for the early green-up. This occurs for at least three reasons: 1) elk are primarily grazers (grass consumers) by nature, 2) there is abundant, high quality grass on the reclaimed areas especially in comparison to surrounding country which exhibits very little if any grassland acreage and relatively low grass production in shrublands, and 3) elk have learned that harassments (such as hunting) are minimized on mining areas (refuge effect) which allows them to forage in relative peace. Likewise, mule deer populations have been observed on reclaimed grasslands at elevated densities (40-60 animals on a daily basis during the Spring, Summer, and Fall periods). Similarly, 15-20 pronghorn utilize the reclamation on a daily basis during the Spring and early Summer periods.

Following the winter, it has been observed in early spring that forage utilization on the reclamation often ranges between 70 and 90 percent, especially near water sources. In fact, utilization is often so elevated that both elk and mule deer turn to the few unfenced shrubs that have been established about the reclaimed area and cause extensive hedging damage. Over the years it has been observed that such hedging eventually leads to the death of most of these over-utilized shrubs.

Because of the dependence on these areas, and the shrub populations, efforts by Colowyo have continued to improve reclamation techniques. New and significant strides are being taken to re-establish sagebrush steppe communities as well as grassland areas. Many of these new measures will benefit not only the large game animal segment of the wildlife community, but also other components such as GRSG and sharp-tailed grouse populations that are dependent on sagebrush and other woody species for forage and cover.

At the conclusion of mining activities, disturbed lands will be restored in accordance with the reclamation plan. Colowyo is continuously working with the regulatory community to improve habitat restoration practices and minimize disturbances to fish and wildlife. As discussed in this revision the Collom Mining area should not impact any species currently listed as threatened or endangered. Big game animals endemic to this area utilize habitat regionally and reclamation efforts will not target them specifically as multiple off-site habitat improvement initiatives are on-going in cooperation with *CPW* to improve big game animal habitat. As impacts to GRSG habitat are going to be an area of high interest for the foreseeable future, it is prudent and appropriate to manage reclamation activities to mitigate impacts to this species specifically, if not exclusively. Efforts to increase the diversity and forage productivity of reclamation units in both the existing operation and Collom area should provide a great benefit to all species impacted by the physical disturbance of mining related activities. Livestock grazing and hunting activities will be reinitiated after full bond release has been granted in the future. These tools will assist in further development of an already diverse reclamation landscape post-mining.

Impacts of Mining Operations on Wildlife Resources within the Mine Plan Area
Several short term negative impacts to wildlife are to be expected in the Collom expansion area. Removal of vegetation communities and habitats will be the most direct impact, resulting in a reduction of forage and cover. Non-mobile species will be destroyed in localized areas as vegetation and topsoil are removed. Mobile species will be temporarily displaced until mined areas are reclaimed. As the mine progresses, some changes in topography will occur through the removal of vegetation, rock outcroppings, draws, etc. which form natural shelters.

Disturbance of soils will affect soil profiles, micro-climate, and other soil properties.

The backfilling and grading as required in Section 4.14.2 will assure that topographic features and drainage patterns will be returned to approved post mine topography.

Wildlife species inhabiting the permit area that have the most potential for being affected include deer, elk, GRSG, and raptors. However, experience to date has shown that all of these species have adapted to the presence of Colowyo's current operation, resulting in minimal direct impact. Most of the mitigation measures, protection measures, and habitat improvement techniques are directed toward this wildlife group.

Disturbance area planning has focused on minimizing impacts to fish and wildlife in the proposed Collom mining area. Where possible high value habitat such as raptor nesting locations and sage-grouse (and sharptail grouse) leks have been avoided. Please refer to Map 46 (Collom Area Reclamation Plan Map) for a quick overview of the locations either directly impacted (or that will likely be impacted) by proposed disturbance in the Collom area, in addition to the proposed locations of stockponds that will provide habitat enhancement value on the reclaimed surface post-mining. These stockponds are defined as "small impoundments" as per Section 2.05.9 which describes the currently approved general construction guidelines/limitations, inspection frequency and maintenance plans for these structures. Pre-planning for a minimum amount of annual disturbance, establishment of beneficial herbaceous species, replacement of native shrub species, and habitat enhancement techniques (variable topsoil depth replacement, small stockponds, etc.) are the most important methods for minimizing long-term impacts to wildlife. The end product of Colowyo's reclamation plan should be the creation of an area that exhibits a net positive value for wildlife habitat (especially for GRSG) and livestock grazing in the future.

Range and Wildlife Management Programs

Data collected during pre-mine studies during 1974 - 1976 indicated overuse by cattle, deer, and elk. A majority of the browse species (serviceberry, oak, snowberry, bitterbrush, sage, chokecherry) showed overutilization to varying degrees. (It has been evident both past and present that many of the shrubs are in a decadent condition.)

The results of past poor range management practices and heavy browse use have been a reduction in growth with less available forage. In addition, species such as oak and serviceberry have grown taller, with palatable growth being limited to a height which can be reached only by the largest animals.

As oak and serviceberry have grown taller, large windbreaks have been created. In the winter, these areas hold the snow, which becomes deep enough to limit all access by deer and elk. Thirty years of observations on the permit area have shown that winter use of the mountain shrub type by elk and deer is highly dependent on snow depth and severity of winter weather conditions. The use of serviceberry has been limited to shrubs near the edges of the stands where less snow buildup occurs. Depending on snow depth, elk and deer populations tend to concentrate on south facing hill slope areas where snow depth is minimal.

Colowyo began fencing the boundaries of the Federal lease during the fall of 1976. The fencing was completed during the summer of 1977. At this time all cattle were removed from the lease area. The fencing was completed as part of an overall grazing management program to improve the rangeland after several years of over-grazing. In 1991, Colowyo constructed a similar fence to provide a boundary for the areas added to the Permit and to exclude grazing in this area. Grazing and hunting activities will similarly be suspended in the Collom area upon approval of this revision as safety concerns for livestock, livestock handlers and hunters make these activities untenable. These activities will be reactivated once full bond release has been achieved in the Collom area. Multiple programs involving the Morgan Creek Ranching for Wildlife operation, GRSG and deer studies are expected to continue long into the future.

Disturbed Areas

Disturbed acreage has been kept to a minimum in the permit area by proper planning for the location of mine support facilities, haul roads, and pit advance. The mining methods, as discussed in Section 2.05.3, allow for a minimum amount of disturbance on an annual basis once pit boxcuts have been developed. Topsoil and vegetation are removed during the summer and fall months to allow for only enough disturbance to facilitate mining advance through June of the following year.

Habitat Improvement Program

Please refer to Volume 1, Section 2.05.4 for detailed information on historical habitat improvement programs previously undertaken at Colowyo Mine.

Many individual habitat improvement initiatives have been completed through the efforts of the *CPW* and the Morgan Creek Ranching for Wildlife operation. These efforts will be continued into the future. The proposed Collom area reclamation plan (collectively Volume 15, Section 2.05.4 and 4.15 and referenced sections from the existing Coloywo permit) specifically target improved shrub establishment over all future reclamation units and focus on the creation of GRSG brood rearing habitat that will improve habitat availability and value for other sagebrush obligate species as well.

GRSG Mitigation

Please refer to Volume 1, Section 2.05.4 for detailed information on GRSG mitigation activities previously undertaken at Colowyo Mine.

Recently, the federal status of the GRSG has been removed from the "Candidate for Listing" list Prior to this development, during permitting activities for the South Taylor Mining area, regulatory developments convinced Colowyo, the Colorado Division of Wildlife and the Colorado Division of Reclamation, Mining and Safety to target GRSG brood rearing habitat for future reclamation planning efforts and overall improvement in shrub establishment on reclaimed lands at Colowyo. The result of these efforts was the approval of TR-72 that rewrote the existing reclamation plan and performance criteria for bond release (TR-72 has since been modified by TR-82 and soon by TR-84 that further refine specific components of the existing reclamation plan). This new plan was developed specifically to create GRSG brood rearing habitat, while promoting improved shrub establishment on all reclamation areas. This effort and focus will continue into the future with Collom expansion area reclamation, as the reclamation plan developed for Collom mirrors the principles and innovations applied to the existing mining area.

As stated previously, Colowyo will focus on sagebrush steppe establishment as a function of GRSG habitat creation. Sagebrush obligate species will also benefit from these efforts as a result. Again, please refer to Map 46 for the location of (potentially impacted) pre-mine GRSG lek areas and proposed stockponds that will add value for GRSG habitat.

The proposed reclamation plan focus, reclamation seed mixes, bond release criteria, interim revegetation monitoring program and pre-planning of disturbance to avoidance high value habitat (leks) where practical, was initiated in large part to specifically mitigate potential impacts to area GRSG populations from mining activity. Consideration was given to all endemic wildlife populations during the creation of the proposed reclamation plan and seed mixes in order to balance multiple uses among different wildlife species, not only on the sagebrush steppe areas, but areas targeted for grassland as well. Justification for the use of specific plant materials proposed for the sagebrush steppe and grassland areas may be found under Section 2.05.4.

Electric power lines located in the permit area will be constructed in accordance with the requirements of Section 4.18 to minimize potential electrical hazards to large raptors.

Vehicle use within the Collom area will be limited to the active mining area and the various support facilities. Off-road vehicle use is kept to a minimum and is usually only authorized for surveying, environmental data collection and monitoring, security, etc. Travel by foot, which causes much more disturbance to wildlife than vehicle traffic, is highly unlikely outside active mining areas.

Any firearm activity inside the proposed Collom area boundaries will be closely managed by Colowyo.

Speed limits in the mine area will be limited to reduce the likelihood of collisions between vehicles and wildlife. Colowyo employees are fully aware of the possibility of encountering wildlife on and around the current operation and will take special care to avoid these species in the Collom area.

With regard to GRSG populations, Colowyo believes that the revegetation metrics presented within this submittal address the concern for negative impacts to area populations and brooding habitat. It is anticipated that GRSG use of reclaimed lands will return to pre-mining levels, or perhaps return to elevated levels as has been experienced at certain Wyoming mining operations.

As per Section 4.3.9 Threatened, Endangered, and Sensitive Species, page 53 of the Environmental Assessment for Lease-by-Application for the Collom Lease Tract COC-68590:

"The approval and issuance of a federal coal lease as defined in the proposed action would not adversely impact any sensitive wildlife species. However, environmental impacts from any surface mining activity could impact sensitive wildlife species. In general, environmental impacts to sensitive wildlife species due to surface coal mining are discussed as follows. Surface and highwall mining techniques are to extract the coal from the proposed 1406.71 acres in the proposed coal lease.

Additional disturbed acreage will be involved with waste-rock disposal sites, mining facilities and access roads. Vegetation and topsoil will be completely removed and stockpiled, making the area temporarily unsuitable as wildlife habitat. This loss of habitat would be short-term in nature, as the area will be concurrently reclaimed as mining progresses and after mining operations cease. As with past operational experience both locally and regionally, it is likely that both the Greater sage-grouse and the Colombian sharp-tailed grouse would return after the rehabilitation of sagebrush and mountain shrub habitats."

Additional Mitigation Measures Recommended By *CPW*

Colowyo has provided CDRMS with copies of the communications between *CPW* and Colowyo that identify additional mitigation strategies Colowyo has proposed in order to further offset disturbance in the Collom Expansion Area. CDRMS received a letter from *CPW* dated February 15, 2011 regarding wildlife mitigation suggestions based on the proposed disturbance area in the Collom Expansion Area. Colowyo management staff met with *CPW* staff on April 29, 2011 to discuss the specific mitigation issues raised by *CPW*'s February 15, 2011 letter to CDRMS. Colowyo subsequently drafted a letter to *CPW* on May 4, 2011 clarifying points of agreement and providing specific proposals for additional wildlife mitigation measures. *CPW* responded to Colowyo's May 4, 2011 letter on May 17, 2011 in a letter further refining their recommendations. Colowyo has agreed to accommodate and is specifically identifying the following recommendations of Colowyo's May 4, 2011 letter to *CPW* and *CPW*'s May 17, 2011 letter to Colowyo that are not already incorporated/required by Colowyo's revised reclamation plan or other process or statute below:

<u>Greater Sage Grouse:</u>

-Colowyo has offered to evaluate current livestock grazing management practices and multiple stakeholder agreements in the Axial Basin and Morgan Creek Ranching for Wildlife areas for identification of additional opportunities to minimize impacts to and enhancement of habitat of GRSG in the area. Input from *CPW* will be a helpful component of these evaluations.

-Colowyo will incorporate the utilization of marking flags on perimeter fences in the Collom Expansion area to minimize incidents of GRSG mortality through grouse/fence collisions.

-Colowyo will treat NPDES discharge ponds for mosquitoes to reduce the potential of West Nile Virus transmission to local grouse populations if this treatment is not specifically precluded by CDPHE regulation of Colowyo's discharge ponds.

-Colowyo is continuing to negotiate with *CPW* regarding direct short-term impact mitigation of initial disturbance activities in the Collom Expansion Area disturbance footprint on off-site (outside permit boundary) areas. Currently, the potential of converting several existing agricultural production (wheat) fields in the Morgan Gulch and Collom Gulch drainages to GRSG habitat are being evaluated. As these areas have been previously incorporated into the management strategies for the Axial Basin Coordinated Resource Management Agreement and the lands incorporated into the

Morgan Creek Ranching for Wildlife Area, Colowyo does not prefer to proceed with this course of action at this time. Colowyo believes that significant opportunities for targeted habitat enhancement including burning/mowing and other manipulations of "old growth" sagebrush communities exist near the proposed area of disturbance. These areas exist inside and immediately outside the proposed permit boundary at the same relative elevation as the proposed disturbance footprint and will be even more beneficial to the specific GRSG populations that will be affected by this permitting action as it would enhance/replace the same habitat type, habitat availability and timing of habitat utilization (based on elevation) that is proposed to be disturbed in the Collom Expansion Area. As these actions constitute off-site mitigation of mining disturbance, Colowyo will continue to pursue an agreement specific to this issue with *CPW* that will be finalized prior to the initiation of mining disturbance in the Collom Expansion Area. Colowyo will continue to provide CDRMS with all relevant communications between *CPW* and Colowyo with regards to this issue moving forward.

<u>Columbian Sharp-Tail Grouse:</u>

-Mitigation efforts identified for GRSG will also benefit Columbian Sharp-Tail Grouse. No specific mitigation efforts have been requested by *CPW* beyond the efforts to be undertaken for GRSG, Mule Deer and Elk.

<u>Mule Deer and Elk:</u>

-Colowyo will incorporate *CPW* recommended guidance for wildlife friendly fencing when constructing new fences in the Collom Expansion Area.

-Colowyo will incorporate supplemental lighting at critical points of the Collom Haul road to the Gossard Loadout in order to improve wildlife visibility and minimize wildlife/vehicle collisions.

-Colowyo will reduce highway haul truck speed limits to 40mph at the locations where the Collom Haul Road to the Gossard Loadout intersects established wildlife travel/migration corridors during periods when wildlife are actively crossing the road to minimize wildlife/vehicle collisions.

-Colowyo will incorporate plant species that are beneficial for mule deer and elk into the seed mix utilized for conversion of the Gossard Loadout facility area wheat fields to perennial vegetation.

-Colowyo will consider incorporation of a wider shoulder on the East side of the Collom Haul Road in areas that do not increase disturbance of wetlands or incur other inadvertent negative environmental impacts. The West side of the Collom Haul Road already incorporates a wide area for tracked equipment travel that will be maintained free of vegetation or managed to maximize wildlife visibility.

-Colowyo will continue to support additional efforts for habitat enhancement activities in the Axial Basin and Morgan Creek Ranching for Wildlife areas.

2.05.6 (3)(a) Protection of the Hydrologic Balance

Surface Water

Surface water will be protected in the mining areas by stormwater management as described in Section 2.05.3(4) of this permit revision application and in the Stormwater Management Plan portion of the Stormwater Discharge Permit and as shown in Exhibit 7, Item 23. Protection includes the use of diversion ditches to route surface water around the mining impact areas.

Current surface water rights will not be impacted by mining operations at Little Collom X or Collom Lite. There is no expected long-term measurable impact to the quantity of surface water in Collom Gulch, Little Collom Gulch, Jubb Creek, or any of their tributaries. Surface water amounts that will be used in mining operations will be within the water rights owned by Colowyo.

Surface water quality of the three creeks is calculated to only be marginally impacted by mining activities. This marginal impact, described in the Probable Hydrologic Consequences section (Section 2.05.6 (3)(b)(iii) below), will be due to meteoric water being captured in and evaporated from the mine pit during operations, and meteoric water contacting an increased surface area of soil in the vadose zone and thereby theoretically increasing the mass of dissolved solids entering shallow groundwater. These dissolved solids in shallow groundwater may eventually enter the surface water system, with a theoretical increase in dissolved solids in the surface water. This increase is calculated to be small enough to have no impact on the current or projected surface water uses in the Collom Gulch, Little Collom Gulch, and Jubb Creek drainages.

Groundwater

Groundwater in the vicinity of the Collom mining areas occurs in perched (unconfined) and confined aquifers of limited areal extent within bedrock of the Williams Fork Formation, the Trout Creek Sandstone (a bedrock aquifer of regional extent), and valley-fill aquifers as described in Section 2.04.7. The Williams Fork Formation aquifers have no beneficial use owing to their limited extent and minimal water production. Based on studies in the Collom Lite area, the saturated water table/piezometric surface is at approximately 7150 feet. This level means that the area in and around the Collom Lite pit outline is under static hydrologic conditions with the water level at approximately 7150 feet. Due to this static condition, Colowyo may dewater this zone to allow mining of the coals below this elevation in the northern cut(s) of the pit.

The Trout Creek Sandstone is a sandstone unit underlying most of the permit area and extending across much of northwestern Colorado. It contains water of useable quantity and quality as demonstrated by beneficial-use wells near the permit area. The Trout Creek Sandstone is stratigraphically several hundred feet below the rock units proposed to be mined and is separated from those strata by low-permeability layers within the Williams Fork Formation, particularly the KM bed, a regionally-continuous clay layer (see Section 2.04.5 and 2.04.6). Additionally, the Trout Creek Sandstone was removed by erosion and structural uplifts north and south of the mining area and so is isolated from the regional perspective. Based on this information, mining is anticipated to have no impact on the Trout Creek Sandstone aquifer.

Groundwater in the shallow valley-fill aquifers of the drainages crossing the proposed permit modification area is calculated to be marginally impacted by surface mining activities, as described in the Probable Hydrologic Consequences section.

There are no registered beneficial-use wells other than monitoring wells in the Colorado Division of Water Resources well database within at least one mile downgradient of the mining area (Map 11C). In Section 2.03.4, Identification of Interests, the legal or equitable owners of record of the property to be mined or affected by surface operations and facilities incidental thereto within the Collom permit expansion area are:

Colowyo Coal Company L.P.

State of Colorado

U.S. Bureau of Land Management

No other private individual or group owns or controls any land in the Collom permit expansion area. Thus, any well within the limits of the Collom permit expansion is controlled by Colowyo. This includes the Dudek and Sweeney wells. Table 2.04.7-44 and Map 11C reflect the location and ownership and control status of these wells.

2.05.6 (3)(b)(i & ii) Hydrologic Controls

Surface water and groundwater drainage from the mining area will be controlled as described in Section 2.05.3(4), Section 4.05 and Exhibit 7, Item 23 of this application. Surface water flow will be diverted around the mining operations where practical. Stormwater that enters the mining operations and water that occurs on the mining operations will be allowed to evaporate or infiltrate.

2.05.6 (4) Protection of Public Parks and Historic Places

No public parks are located within the permit or adjacent areas; therefore no public parks will be affected by the proposed mining operations. The proposed mining operations are anticipated to affect specific sites and areas listed or eligible for listing in the National Register of Historic Places. These sites are discussed in further detail in Sec 2.04.4. A treatment plan has been prepared for some of the sites expected to experience impacts from the development of this mine. This treatment plan will identify specific mitigation processes needed to develop in and around these sensitive locations.

2.05.6 (5-6) Surface Mining near Underground Mining; Subsidence Control

No surface mining activities will be conducted within 500 feet of an underground mine. Therefore, there is no subsidence control plan for proposed operations.

RULE 4 – PERFORMANCE STANDARDS

4.02 SIGNS AND MARKERS

4.02.1 Specifications

Colowyo has posted and will maintain all signs and markers required by this section. All signs are of uniform design, can be easily seen or read, and are constructed of either metal or wood. Signs will be constructed to withstand extreme climatic conditions and conform to local ordinances and codes. All signs and markers will be maintained throughout the operational period of the mine.

4.02.2 Mine and Permit Identification Signs

Appropriate signs identifying the mine area are displayed at the point of access to the permit area from Highway 13/789. These signs indicate the name, business address, and telephone number of Colowyo and identification numbers of mining and reclamation permits. Additional signage will be installed as appropriate for the Collom permit expansion area.

Coal will be transported from the Collom mining area by highway trucks along portions of Moffat County Road 51. Signage, as required by CDRMS and Moffat County, will be posted prior to beginning transport activities. Appropriate signage will be posted along each side of the haul road entrances.

4.02.3 Perimeter Markers

The perimeter of the existing permit area is clearly marked with metal signs and/or wire fencing where appropriate. Additional markers may include steel fence posts painted orange or capped with PVC caps painted orange. Additional signage will be posed to mark the Collom permit expansion areas.

4.02.4 Duration of Maintenance

Colowyo will maintain signs and markers throughout the life of the operation or post new signs and markers as necessary.

4.02.5 Stream Buffer Zone Markers

Stream buffer zone signs will be posted in the existing mining area where appropriate. Additional signage will be installed as appropriate for the Collom permit expansion area.

4.02.6 Blasting Signs

Colowyo displays signs reading “Blasting Area” along any blasting area that comes within 50 feet of any road within the permit area or within 100 feet of any public road right-of-way. The blast warning and all-clear signals are clearly explained at the main entrance to the permit area from

Highway 13/789. A sign stating "Blasting Area, Be Careful" will be placed at the entrance to the Colowyo revised permit area from Highway 13/789.

4.02.7 Topsoil Markers

Colowyo clearly marks all stockpile topsoil with signs reading "Topsoil."

4.03 ROADWAYS

The following sections identify roads as defined per Rule 1.04 (111).

4.03.1 Haul Roads

Access to the Collom Lite and Little Collom X mining areas will require the construction of a haul road running northeast through the permit expansion area and near the active pit areas to support mine operations. The construction and maintenance of the roadway from pit area to Gossard Loadout and pit haul roads proposed near the Collom Lite Pit are discussed in Section 2.05.3(3). Locations of these proposed haul roads are shown on Maps 25E, Sheets 1-9 and 25D (Collom Haul Roads) respectively. These haul roads will be constructed to meet standards set in Rule 4.03.1. All outslopes of this road outside of the pit disturbance area will be seeded with the seed mix listed in Section 4.03.2 post construction.

Following construction, a report by a registered professional engineer shall be provided to the Division indicating that the roads have been built as designed. Following mining activities, certain roads may remain in place as a private ranch road and therefore would not be reclaimed. Colowyo as the land owner would have to provide the Division with a letter documenting this request at the appropriate time.

Haul roads that will be constructed in the actual mining areas will constantly change as the operation progresses. The "in-pit" roads will be maintained by a motor grader and regularly wetted to minimize dust as required by the air quality permit. Any drainage off the "in-pit" roads will be retained in the pit.

Colowyo will maintain the haul roads throughout the life of the mine with repairs including blading, filling of potholes, and replacement of road surface as necessary. Likewise, watering for dust control will be implemented as necessary. Other information relevant to haul roads is provided in Section 2.05.3(3).

4.03.2 Access Roads

In order to obtain access to the Little Collom Sediment Pond, an existing two track road will be upgraded as shown on Volume 20, Exhibit 25, Item 1. This road, which is about 6,600 feet in length, has been designed to meet the applicable portions of CDRMS Rule 4.03.2 for Access Roads. It is specifically designed to meet the minimum design requirements while minimizing additional disturbed area and preventing environmental damage. The road ties to existing county road 32. The completed road will have a width of 12 feet. Additional discussions of this access road may be found under Section 2.05.3(3).

Use of road is for routine environmental monitoring and occasional pond maintenance only. Typical road use would consist of one trip per week by a light use vehicle using one way travel and low speed. Horizontal alignment will exactly follow existing two track road alignment and is consistent with existing natural topography. Overall grade of the road is approximately 6 percent. The existing two-track road will be hard bladed to remove all vegetation and rutting and to provide a level surface across roadway, with maximum cut and fill depths of less than 2 feet. Following blading, a minimum 4 inch thickness of clean, minus 2 inch gravel shall be placed and compacted across the entire width. A triangular V-ditch approximately 18 inches in depth shall be cut on the uphill (Eastern) side of the completed roadway. Routine road maintenance will consist of occasional blading and drainage control. Any outslopes created from the construction of this access road will be seeded with the mix listed below, post construction.

The access and proposed haul road cut/fill stabilization seed mix is as follows:

Western wheatgrass @	4 Lbs PLS/Acre
Mountain Brome @	4 Lbs PLS/Acre
Kentucky Bluegrass @	2 Lbs PLS/Acre
Sanfoin @	2 Lbs PLS/Acre
Total	12 Lbs PLS/Acre

Following construction, a report by a registered professional engineer shall be provided to the Division indicating that the roads have been built as designed. Following mining activities, the road may remain in place as a private ranch road and therefore would not be reclaimed. Colowyo as the land owner will provide the Division with a letter documenting this request at the appropriate time.

4.03.3 Light-Use Roads

Light roads may be used in portions of the Collom permit expansion area and are shown on Map 22B. Construction and maintenance of these roads are discussed in the original permit document. There will be no changes to this section resulting from the Collom Lite and Little Collom X pits.

4.04 SUPPORT FACILITIES

The original support facilities used at the mining operation, including the office, shop and warehouse complex, and the coal handling and loadout facilities may continue to serve as minor support facilities for this expansion and are shown within the original Colowyo Permit Map 21 and Map 22, Volume 8. Many of the support structures were constructed at the mine start-up in 1976-1977. The complete discussion on all the original support facilities is found under Section 2.05.3 of the existing permit document.

Additional facilities, including a shop and warehouse facility, coal crushing, explosives bunker, sedimentation ponds, utility lines, water lines, and haul roads will be constructed in and around the Collom Lite and Little Collom X pit areas. These facilities are detailed in the Structure and Facilities Map 22B.

Detailed drainage and sediment control has been developed for the mining operation and support facilities as discussed in Section 2.05.3. All sediment control measures in the permit expansion area will be designed to prevent damage to wildlife and other related environmental values; also, sediment control structures in the permit expansion area will be designed to prevent contributions of suspended solids to runoff outside the permit area in excess of the limitations of both federal and state law.

As discussed throughout this submittal, Colowyo will conduct the surface mining activities in a manner that will minimize impacts on the environment.

There are no operating oil or gas wells at or around the planned mine; likewise, there is no coal slurry pipeline planned or around the mining area. The only operating railroad in the vicinity of the mine is the Colowyo spur line that serves the operation. All White River Electric and Tri-State Generation and Transmission Association, Inc. power lines are located out of the actual mining area. The Mountain Bell telephone lines are located outside of the actual mining areas. All water and sewer lines located in the permit area serve the Colowyo structures and are located away from the actual mining areas.

4.05 HYDROLOGIC BALANCE

4.05.1 General Requirements

The surface mining activities at Colowyo have been planned and will be conducted to minimize changes in the prevailing hydrologic balance, in both the permit and adjacent areas, and to prevent long term adverse changes in the balance that might result from the activities.

As a preliminary step in minimizing adverse changes, hydrologic baseline information has been collected, compiled and analyzed. The baseline monitoring programs are outlined in Section 2.04.7. This data provides detailed information on quality and quantity of surface water, drainage patterns, and geology. The description of the current hydrologic monitoring program is included in the following pages and results of the current monitoring program are included in the Annual Reports for 1983 through the present. In addition, Sections 2.05.4 and 2.05.5 detail the specific mining and reclamation techniques which Colowyo will implement to minimize changes to the hydrologic balance.

The post-mining land use as described in Section 2.05.5 will be rangeland. Changes in the hydrologic balance will be minimized so that the post-mining land use will not be adversely affected.

Water quality standards and effluent limitations at the existing mining operation are regulated by the U. S. Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment under the terms of an NPDES Permit, and by the Coal Regulations of the Colorado Mined Land Reclamation Board. The applicable effluent limitations will be met by using treatment methods that will include contemporaneous revegetation, minimizing disturbed areas, sediment retention, use of contour furrows, sediment ponds and, if necessary, strategically placed energy dissipaters, such as riprap, check dams, mulches, filters and dugouts. Water quality control measures are discussed in detail under Section 2.05.4 and 2.05.6.

Where practicable, diversion methods will be used to change the flow of water from undisturbed areas so as to bypass the disturbed areas rather than use treatment facilities. The principal technique to be used for this purpose will be diversion ditches. These diversion ditches are shown on the figures in Exhibit 7, Item 23, Part E and discussed in detail under Section 2.05.6. Their design is specified in Exhibit 7, Item 23, Part E.

No acid-forming materials are present in the area to be mined which would require selective placement and sealing of overburden (Exhibit 6). The chemical characteristics of the overburden are presented under Section 2.04.6. The overburden sampling program is presented under Section 2.05. Results of the current overburden sampling program are presented in the Annual Reclamation and Hydrology Reports beginning in 1983 to the present.

As discussed in Section 2.05.4, Colowyo will use various surface manipulation techniques on the topsoil after its redistribution as one method to prevent excessive wind or water erosion.

No special treatment of coal processing waste is necessary since none will be produced. See Section 4.10 and 4.11.

Colowyo plans to have all surface runoff from the disturbed areas pass through sedimentation ponds. Sedimentation ponds are discussed in detail under Section 4.05.6, and their locations are shown graphically on the structure and facilities map (Map 22B) and in Exhibit 7, Item 26.

Colowyo employs various methods to manage water that periodically collects internal to the mining operation and does not reach sedimentation ponds. Various sumps, ditches, pumps, hoses and pipes, etc. will be employed to control water within pits and/or route water between pits. The ultimate destination of such water will be for operational use (i.e. dust control), evaporation, or seepage into the backfilled spoil areas.

In addition to the mining, reclamation, and treatment methods described and referenced in this section, further protection of the hydrologic balance will be established by an on-going plan for monitoring potential changes in surface water quality and quantity and alluvial groundwater quality. This monitoring plan is described under Section 4.05.13 and the monitoring locations are graphically shown on Map 10B.

4.05.2 Water Quality Standards and Effluent Limitations

The plan for protection and control of drainage and sediment described in 2.05.6 provides that surface drainage from the disturbed area within the permit area will be passed through sedimentation control structures. All ponds will be constructed and maintained to contain or treat the volume for a 10-year, 24-hour precipitation event. The accumulation of sediment in the ponds will be monitored quarterly. In addition, grab samples of water, as required, will be collected from pond discharges to measure the effectiveness in meeting the applicable Colorado and Federal water quality standards. A demonstration of the effectiveness of sediment control structures to be constructed around several topsoil stockpiles planned outside of primary sediment control may be found under Exhibit 7, Item 23, Part D.

The proposed sedimentation ponds have been designed and will be constructed and maintained to effectively trap sediment from runoff resulting from precipitation events up to and including the 10-year, 24-hour precipitation event.

Drainage from the mining area, after treatment in sedimentation ponds, is not anticipated to exceed the effluent limitations of any federal or Colorado agency requirements. Baseline alluvial groundwater quality is discussed in Section 2.04.7. No acid mine drainage of pH equal to or less than 6.0 is expected. For further details relating to the sediment pond discharges, refer to the NPDES reports found in the Annual Reports from 1983 through the present.

Historically, Colowyo has experienced no pH problems with water discharges sampled in the vicinity of the Colowyo operations. As reported in Section 2.04.7, all pH values of water samples taken in the vicinity of the Colowyo operations have ranged between 6.8 and 8.8; therefore, it is anticipated that no acid mine drainage will occur as the operations move to the Collom permit expansion area.

4.05.3 Diversions and Conveyance of a Watershed Less than One Square Mile

The drainage and sediment control measures described under Section 2.05.6 and presented in the Erosion and Sedimentation Control Plan (Exhibit 7, Item 23, Part E) and Map 41B will provide for temporary diversion of surface drainages within the permit area, as needed for mine operations. A system of temporary ditches will be used to divert runoff from disturbed areas to sediment ponds. Temporary diversions will be constructed to pass at a minimum the runoff from the precipitation event with a two-year recurrence interval.

The temporary diversions drain watersheds less than one square mile in size and serve to reduce the contribution of suspended solids to runoff. The diversions will be constructed with a minimum gradient to pass the design flow. If not removed by mining, upon completion of mining and at an appropriate point mandated in the Coal Regulations of the Colorado Mined Land Reclamation Board, the temporary diversions will be reclaimed as required in Section 4.05.17.

Any topsoil stockpile areas that may be constructed outside the confines of engineered sediment control structures will be required to have a perimeter ditch and berm constructed around the entire footprint of the stockpile sufficient to capture and retain any rainwater/snowmelt that may be generated from the stockpile area to preclude loss and/or contamination of the topsoil resource. A demonstration of the effectiveness of sediment control structures to be constructed around several topsoil stockpiles planned outside of primary sediment control may be found under Exhibit 7, Item 23, Part D.

4.05.4 Stream Channel Diversions (Relocation of Streams)

The drainage and sediment control measures described under Section 2.05.6 and presented in the Erosion and Sedimentation Control Plan (Exhibit 7, Item 23) and Exhibit 7, Item 25 –Collom

Post Mine Channel Design will provide for diversion or relocation of three ephemeral surface drainages within the permit area. No perennial streams will be diverted for the proposed project. Stream channel diversions will be constructed to pass at a minimum the runoff from the 100-year, 24-hour precipitation event.

The diversions will be constructed with a minimum gradient to pass the design flow and will be stabilized with grasses or riprap. If not removed by mining, upon completion of mining and at an appropriate point mandated in the Coal Regulations of the Colorado Mined Land Reclamation Board, the stream channel diversions will be reclaimed as required in Section 4.05.17.

The only stream channel that will be impacted by the Collom Lite pit is the main stream of Little Collom Gulch, an ephemeral stream draining less than one square mile at the proposed upstream pit boundary. It will not be diverted at the upstream boundary due to the small upstream drainage area, low runoff production potential, and the impracticality and land disturbance associated with constructing a diversion along steep canyon slopes. It will be channelized further downstream, alongside the haul road leading from the Collom Lite pit to the proposed spoil pile, where it drains greater than one square mile. This section will be subject to a 100-year design.

The eastern lobe of the Little Collom X pit will intersect two small tributaries of Little Collom Gulch, which collectively drain approximately one square mile. These tributaries will be diverted around the pit in a ditch designed for the 100-year event.

Two small ephemeral tributary gullies located east of the proposed spoil pile will also be affected by operations. They will not be diverted, and will instead flow into gravity sorted material under the proposed spoil pile.

The drainage and sediment control measures described under Section 2.05.6 and presented in the Erosion and Sedimentation Control Plan (Exhibit 7, Item 23, Part E) and Map 41B will provide for temporary diversion of surface drainages within the permit area, as needed for mine operations. A system of temporary ditches will be used to divert runoff from disturbed areas to sediment ponds. The natural drainage systems will be restored to historic drainage patterns once diversion ditches are removed; therefore, there will be no permanent diversions of these channels.

4.05.5 Sediment Control Measures

Sediment control measures to be implemented are shown in the Erosion and Sedimentation Control Plan (Exhibit 7, Item 23 in addition to Items 25-26). These facilities, consisting primarily of diversion ditches and sedimentation ponds, will be located, constructed and maintained to avoid erosion and increased contribution of sediment load to runoff.

Facilities to control sediment are typically installed in areas above and/or below the planned sites of disturbance. "Upstream" facilities, such as temporary diversion ditches and check dams upslope from the mining activities, serve to divert runoff away from the disturbed areas. Because the Collom Lite mining activities extend nearly to the top of the drainages, no upstream facilities are proposed for Collom Lite. Upstream diversions are proposed for portions of Little Collom X, as discussed above. Temporary diversion ditches below the disturbed area of both pits will help collect runoff from disturbed areas and route it into the sedimentation ponds. During active mining, the mining areas will aid in retaining sediment within the disturbed areas by catching water in pits, small depressions and dozer basins, etc. This captured water and sediment will not leave the mining areas. Once reclaimed, the basins will drain as they did prior to mining activities (i.e., historic drainage patterns will be re-established).

All temporary diversions will be removed and reclaimed when no longer needed for sediment control in accordance with the Operations and Reclamation Plan described in 2.05.4.

Channel lining rock riprap and energy dissipaters will be used when necessary. As stated above, all temporary diversion structures will be seeded and revegetated after removal. Colowyo does not anticipate that there will be any significant excess material resulting from the construction of diversion ditches.

None of the proposed diversions will drain into underground mines.

4.05.6 Sedimentation Ponds

The location, design parameters, and detailed sedimentation calculations of all planned sedimentation ponds are presented in Erosion and Sedimentation Control Plan (Exhibit 7, Item 23). Additional information may be found in Exhibit 7, Item 26 (Collom Pond Design Maps). The design plans and specifications for the sedimentation ponds are described in this section. All sedimentation ponds will be located as close as practical to the areas to be disturbed. Steep terrain in the upper basins precludes location of the ponds at the Collom Lite disturbance boundaries during the critical early phase of operations, necessitating down-valley locations within and downstream of the Little Collom X footprint. In later phases, in-pit ponds will be developed in Collom Lite. Other methods of sediment control will be located on the reclaimed areas; these methods include the use of contour furrowing, contour drainage ditches, chisel plowing, and revegetation.

Colowyo has specifically provided information regarding Rule 4.05.9(7) a thru e with respect to the Little Collom Sediment Pond below. The following are references to locations where each of these is addressed.

a. Vegetative, organic material removed, cut slopes flatter than 1:1

Construction notes on Exh. 7, Item 26, Figure 1 require all organic and other deleterious materials be removed prior to placing fill. Cut slopes for the centerline trench are called out as 1:1

b. Sod, large roots, other vegetative matter, frozen soil, mine processing waste not to be included in fill material.

The above materials are satisfactorily excluded as “unacceptable” fill materials in the notes on Exh. 7, Item 26, Figure 1. Mine-processing waste has been added to the list of unacceptable materials.

c. Spread fill in loose lifts starting at the valley bottom, with compaction as per approved plans

The “Fill Placement and Compaction” note in Exh. 7, Item 26, Fig. 1 requires thin horizontal lifts, and presents other generally accepted compaction specifications for earthfill dams.

d. Minimum 1 foot of freeboard when discharging design flood

The peak pool elevation when discharging the spillway design flood (25 yr.24 hr storm) is EL. 6643.28 as described in Table 7-23C-2 for “Initial Mining Phase. The crest of the dam is EL. 6649 as shown on Exh. 7, Item 26, Figure 1. The overall embankment height is about 30 feet above existing grade, and with the 95 percent Std Proctor compaction specified is not expected to settle more than a few inches. Combined settlement of the embankment and underlying foundation soils was estimated as 9 inches or less by Shannon and Wilson in their June 30, 2009 report (Included in Volume 20 of the application). This would leave 5 feet of freeboard while passing the spillway design flood flow.

e. Combined upstream and downstream slopes no steeper than 5:1

The slopes shown on Exh. 7, Item 26, Figure 1 are 2:1 downstream and 3:1 upstream, satisfying the combined slope requirement for 5:1.

Additional information regarding permanent post-mine “small impoundment” design can be found in Exhibit 7, Item 23.

This application contains calculations used to determine runoff volumes and flow rates for the theoretical 10-year, 25-year, and 100-year, 24-hour precipitation events, as well as annual sediment volumes. The precipitation data were obtained from the NOAA Atlas 2, Volume 3 for Colorado; soil types were obtained from the Soil Conservation Service, and are shown on the soils survey map (Map 5D).

The ongoing mining activities within each watershed of the permit area will create constantly changing hydrologic conditions. The design models are generally based on a static, theoretical scenario, utilizing SEDCAD 4, which considers the worst-case scenario. The worst-case scenario occurs approximately 6 months after the start of mining, when topsoil has been stripped and stockpiled for all of Little Collom X, and portions of Collom Lite, but no mining or sedimentation control installation has yet occurred in Collom Lite, and reclamation has not yet been attained for any areas. Refer to Exhibit 7, Item 23 for a delineation of the areas used for these modeling purposes as well as the maps associated with the SEDCAD runs. The 6-month disturbance boundary indicated in Exhibit 7, Item 23 is for development of the worst-case scenario for hydrologic modeling and does not represent a definitive schedule for mining and reclamation activities.

The scenario used for the sedimentation ponds corresponds to an active, disturbed operation. In terms of groundwater, Colowyo's pits have remained essentially dry. Pumping of pit water (precipitation induced surface runoff) into sedimentation ponds is not anticipated. Discharges from the ponds will remain in compliance with Colowyo's CDPS Discharge Permit. The use of flocculants in sedimentation ponds may also be used in accordance with the provisions of the CDPS Permit.

Sediment will be removed from all sedimentation ponds on an as needed basis or when the sediment level will not allow effective treatment of the runoff resulting from the 10-year, 24-hour precipitation event in accordance with Rule 4.05.2. Quarterly inspections will note the level of sediment in each pond. Ponds will typically be cleaned of sediment when water levels are lowest, and the least amount of precipitation is expected. The removed sediment may be used as topsoil or subsoil if it meets the suitability criteria discussed under Section 2.04.9 or placed in the backfill of the pits. The Division will be notified of this determination if the material is selected as overburden material that can be substituted for or as a supplement to topsoil.

All sedimentation ponds will be designed so that the minimum elevation at the top of the settled embankment is at least one foot above the elevation of the water surface in the pond with the emergency spillway flowing at design depth.

Colowyo will design, construct, and maintain the sedimentation ponds to prevent short-circuiting to the extent possible. As a general rule, the inflow to the ponds will be at the opposite end from the outflow area. The constructed height of the sedimentation pond embankment will be designed to allow for settling. During construction, a registered professional engineer will ensure that the appropriate embankment height is accomplished. For all sedimentation ponds, the entire embankment, including the surrounding areas disturbed by construction, will be seeded after the embankment is completed, using the Topsoil Stockpile/Pond Embankment seed mix described below. The active upstream side of the embankment where water will be impounded will be riprapped or otherwise stabilized, where necessary. Areas in which revegetation is not successful or, where rills and gullies develop, will be repaired and revegetated.

Colowyo will inspect the condition of each sediment pond, sediment trap, or future post-mining stock reservoir on a quarterly basis. All of these types of structures meet the requirements of an impoundment, and the inspection procedures will meet the requirements under Rule 4.05.9 (17). Previously, Colowyo has received a waiver from quarterly inspections for several existing stock reservoirs within the current permit area as described under Section 4.05.9. This waiver changed the inspection frequency to annual. Following construction of any future post-mining stock reservoir proposed in the Collom permit expansion area, Colowyo may request a similar waiver but until that is approved, the quarterly frequency would apply. Results of all impoundment inspections will be submitted annually.

Topsoil Stockpile/Pond Embankment Seed Mix*

Western wheatgrass @	4 Lbs PLS/Acre
Thickspike wheatgrass** @	4 Lbs PLS/Acre
Yarrow*** @	0.15 Lbs PLS/Acre

*mix may be modified as a result of an updated Reclamation Plan, currently under review.
**option to replace Thickspike wheatgrass with Beardless bluebunch wheatgrass or Sheep fescue
***option to replace Yarrow with Cicer milkvetch

4.05.7 Discharge Structures

The sedimentation ponds at Colowyo are designed to treat the theoretical 10-year, 24-hour storm event in accordance with Rule 4.05.6(3)(a). As such, the general operation of the ponds will be a passive discharge system where water is allowed to discharge automatically as necessary. Colowyo will sample discharges as appropriate to remain in compliance with applicable CDPS Permit requirements. Pond dewatering through a manual headgate may be performed as necessary to lower the water level depending on operational requirements. Manual dewatering of ponds will meet applicable CDPS Permit standards. Discharge from sedimentation ponds will be controlled by energy dissipaters and flow check devices where necessary. All embankment ponds utilize separate principal and emergency spillways with the emergency spillway located at a minimum of 1 foot above the elevation of the maximum water surface during the discharge of the 10-year, 24-hour storm event through the principal spillway. The principal spillways are designed for the 10-year, 24-hour storm event and the emergency spillways are designed to pass the 25-year, 24-hour storm event in accordance with Rule 4.05.6(5). The design requirements for existing ponds can be found on each of the pond as-built drawings or in Exhibit 7, Item 15 of the existing permit document. All embankment sedimentation ponds will provide a non-clogging dewatering device or conduit spillway to remove water storage from inflow. Design requirements for the currently proposed ponds can be found in Exhibit 7, Item 23. For compliance purposes, in systems that incorporate ponds in a series, CDPS effluent quality parameters will only apply to the last pond in the series that directly discharges into the receiving stream or drainage. Out of pit designed ponds internal to the last pond in the series will be inspected and maintained in the same manner as the "compliance" pond to ensure proper sediment control and design performance.

4.05.8 Acid-forming and Toxic-Forming Spoil

Acid forming materials do not exist in significant quantities within the overburden to be removed by the mining operations. A discussion on the overburden at the Colowyo operation has been conducted as set forth in Section 2.04.6. A discussion of the overburden monitoring plan is set forth in Section 2.05. Acid-Base Accounting shows that 19 out of 4,212 feet of analyzed over- and inter -burden has a net acid-generating potential, and the average acid-neutralizing potential to acid-generating potential ratio is strongly weighted toward acid-neutralizing in each borehole (Exhibit 6, Item 9).

4.05.9 Post-Mining Impoundments

Colowyo constructs small impoundments on reclaimed areas in accordance with Section 4.05.9 of the CMLRD regulations for Coal Mining, 3/21/01. These small impoundments are essential and basic to the management of the rangeland post-mining land use of livestock grazing and wildlife habitat. The design of post-mining impoundments provides for structures having a vertical height less than five feet from the bottom of the channel to the bottom of the spillway and impound less than two acre-feet of water. As such they are exempt from Division of Water Resources, Office of State Engineer requirements. Water harvesting ditches may also be used to enhance the function of the impoundments, which is consistent with practices employed on adjacent rangelands.

The impoundments collect surface runoff from precipitation events and snowmelt from reclaimed areas. The impoundments do not result in the diminution of the quality or quantity of water for downstream water users. Colowyo is the holder of water rights immediately downstream. During periods of low precipitation, the impoundments may be dry, which is consistent with regional practices on similar rangelands. Since the source of water is surface runoff from revegetated areas the quality of the water will meet the requirements of the intended use.

The post-mining impoundments have slopes of 3h:1v or less to provide easy access to both livestock and wildlife. These impoundments and any associated ditches, while intended to be permanent, will be classified as temporary until the requirements of Rule 4.05.9 are met. Prior to construction, all designs are submitted to the Division. A copy of the as-built design information will be submitted after construction for inclusion into Exhibit 7, Item 23. In addition, sedimentation ponds that are subsequently approved as part of the post-mining land use, as shown on the hydrology Map 41B, will remain as permanent impoundments after the requirements of Rule 4.05.9 have been met. Please refer to Section 4.05.6 for additional information regarding compliance with Rule 4.05.9(7)(a thru e).

All embankments, impoundments, and associated structures will be revegetated if construction materials are conducive to plant growth. If not, rock or gravel will be used on the embankments. The quarterly routine inspections of these structures will be conducted as required by Rule 4.05.9(17) if and until a waiver is granted to allow for annual inspections of these structures in the future. As per Rule 4.05.9(14) requirements, inspections performed during and after construction of these structures will be performed by a qualified registered professional engineer or other qualified professional specialist under the direction of a professional engineer. The inspections will be made regularly during construction, at completion of construction, and at least annually (quarterly until such a time as annual inspections are requested from granted by DRMS) until removal of the structure or release of the performance bond. The qualified registered professional engineer shall provide the Division with a certified report that the impoundment has been constructed and/or maintained as designed, and in accordance with the approved plan and the applicable regulations. As per Rule 4.05.9(15), certified inspection reports shall include discussion of:

1) Any appearance of erosion, instability, structural weakness or other hazardous conditions;
2) Existing and required monitoring procedures and instrumentation;
3) The depth and elevation of any impounded waters at the time of the certified report;
4) Existing storage capacity of the impoundment; and
5) Any other aspects of the structure affecting stability, or requiring maintenance.

Colowyo will maintain a copy of each certified report at the mine site.

Colowyo successfully demonstrated that failure of small impoundments would not create a threat to public health and safety or threaten significant environmental harm. A written safety demonstration completed by a professional engineer is located in Exhibit 7, Item 11 of the existing permit document in accordance with rule 4.05.9(18)(b). None of the small post-mining impoundments act as primary sediment control structure for a particular area; they are all constructed in reclaimed areas of the mine to enhance the approved postmining land use; they are all under two-acre feet.

All impoundments will be maintained according to the specifications set forth in this part. Maintenance for impoundments may include (if necessary) mowing and cutting of excess vegetative growth for the purpose of facilitating inspections and repairs including keeping ditches, culverts, spillways, and other outflow structures free of debris. All combustible material, other than mulch or other material needed for erosion control and surface stability (vegetative growth) will be removed.

Plans for any modification of any sedimentation impoundments or dams will be submitted to the Division, and no modification will begin until approval of the plans have been granted unless such modification is necessary on an emergency basis for public health, safety or the environment would be endangered.

Colowyo will inspect the condition of each pond quarterly (until a waiver for annual inspection is granted) with the reports submitted quarterly as well. None of Colowyo's post-mining impoundments will meet the size criteria of 30 CFR 77.216(a)(1989).

4.05.10 Underground Mine Entry and Access Discharges

Colowyo currently conducts surface coal mining exclusively.

4.05.11 Groundwater Protection

There are no aquifers or continuous sources of groundwater within the stratigraphic section from which the Colowyo Mine mines coal using surface mining techniques. This is also noted in Section 2.04.7. In addition, there are no continuous aquifers of regional extent within the entire Williams Fork Formation in the location of the Colowyo Mine. Occasionally, a minimal amount of water is found under perched conditions in noncontiguous lenticular sandstones and in fractured coal under the sandstones. No toxic concentrations of acid-forming materials have been found in the overburden, reclaimed slopes or surface and groundwater system associated with the Colowyo Mine. No adverse effects on groundwater quality are expected to occur due to mine excavations or backfilling.

4.05.12 Protection of Groundwater Recharge Capacity

The reclamation plan as described in 2.05.4 will return the disturbed lands to approximately the pre-mining condition; therefore, groundwater recharge capacity is expected to approximate the pre-mining condition. Also, because of the minimal existence of ground water in the mining area, the mining operation and subsequent reclamation should have no adverse effect on the existing groundwater recharge capacities.

4.05.13 Surface and Groundwater Monitoring

The proposed monitoring program will replace the existing monitoring program in its entirety. This section replaces Section 4.05.13 of Volume 12, as amended. Colowyo proposes monitoring the following sites:

<u>Sedimentation Ponds</u> - The proposed surface water monitoring plan includes monitoring required under the NPDES Permit Number CO-0045161 issued by the Colorado Department of Public Health and Environment. Colowyo will measure the quantity and quality of any discharges from the permit area in compliance with the NPDES Permit and in accordance with permit requirements. Please refer to Colowyo's discharge permit for a list of monitored parameters.

Colowyo will report the discharge in accordance with the Clean Water Act of 1977 under the NPDES Permit on a quarterly basis; therefore, Colowyo will plan to use the NPDES report for filing with the Division. All surface water and shallow groundwater monitoring data is submitted in an annual report. Annual Hydrologic Reports for the period of January 1st through December 31st will be submitted by April 1st of the following year.

At various times, due to unforeseen circumstances, Colowyo will obtain and discharge water under a CDPS minimal discharge permit. In the event that water is discharged under a minimal discharge permit, Colowyo will report the discharge in the corresponding Annual Hydrologic Report.

Surface Water - Five additional surface water sites will be monitored to some degree as a result of expanding mining activity into the Collom Expansion Area. The existing six surface water sites will continue to be monitored to some degree. These points include five locations along Good Spring Creek and one location along Taylor Creek.

Monitoring Type	Monitoring Location	Monitoring Frequency	Quarterly Field Parameters	Quarterly Laboratory Parameters
Surface Water	Upper Collom Gulch (UCG)[1]	Quarterly	Flow from Parshall Flume. See List Below	See List Below.
Surface Water	Lower Collom Gulch (LCG)[2]	Quarterly	Flow from Parshall Flume. See List Below.	See List Below.
Surface Water	Lower Little Collom Gulch (LLCG)[3]	Quarterly	Flow from Parshall Flume. See List Below.	See List Below.
Surface Water	West Fork of Jubb Creek (WFJC)[4]	Quarterly	Flow from Parshall Flume. See List Below	See List Below.
Surface Water	Confluence of Jubb Creek (CJC)[5]	Quarterly	Flow from Parshall Flume. See List Below	See List Below.
Surface Water	Lower Taylor Creek (LTC)[6]	Quarterly	Flow from Parshall Flume. See List Below	Flow from Parshall Flume. See List Below
Surface Water	Lower West Fork Good Spring Creek (LWFGSC)[7]	Quarterly	Flow Only taken from Parshall Flume. Volume added to EFGSC measurement to apply to actual flow for NUGSC.	Flow Only taken from Parshall Flume. Volume added to EFGSC measurement to apply to actual flow for NUGSC.
Surface Water	East Fork Good Spring Creek (EFGSC)[8]	Quarterly	Flow Only taken from Parshall Flume. Volume added to LWFGSC measurement to apply to actual flow for NUGSC.	Flow Only taken from Parshall Flume. Volume added to LWFGSC measurement to apply to actual flow for NUGSC.
Surface Water	Upper West Fork Good Spring Creek (UWFGSC)[9]	Quarterly	Flow from Parshall Flume. See List Below	Flow from Parshall Flume. See List Below

Monitoring Type	Monitoring Location	Monitoring Frequency	Quarterly Field Parameters	Quarterly Laboratory Parameters
Surface Water	New Upper Good Spring Creek (NUGSC)[10]	Quarterly	See List Below. Flow estimated by combining measurements taken from LWFGSC & EFGSC.	See List Below. Flow estimated by combining measurements taken from LWFGSC & EFGSC.
Surface Water	Lower Good Spring Creek (LGSC)[11]	Quarterly	Flow from Parshall Flume. See List Below	Flow from Parshall Flume. See List Below

1. Upper Collom Gulch (UCG) represents the water quality conditions in Collom Gulch upstream of the Collom Lite mining area. No impact on flow or water quality at UCG is anticipated.

2. Lower Collom Gulch (LCG) represents the conditions in Collom Gulch downstream of mining impacts. No impact on flow or water quality at UCG is anticipated.

3. Lower Little Collom Gulch (LLCG) represents the conditions in Little Collom Gulch downstream of all mining disturbances. Because Little Collom Gulch is ephemeral, and the mining area extends nearly to the headwaters, no upstream monitoring location can be established.

4. West Fork of Jubb Creek (WFJC) represents conditions in the Jubb Creek watershed adjacent to the mining disturbance.

5. Confluence of Jubb Creek (CJC) represents the aggregate water quality in the Jubb Creek basin, downstream of potential mining impact areas.

6. Lower Taylor Creek (LTC) represents the water quality conditions of Taylor Creek directly downstream of the South Taylor mining area and immediately prior to the confluence with Wilson Creek and immediately downstream of the Gossard Loadout.

7. Lower West Fork Good Spring Creek (LWFGSC) represents this tributary after potential impacts caused by South Taylor mining.

8. East Fork Good Spring Creek (EFGSC) represents the upstream, undisturbed background condition of the East Fork Good Spring Creek.

9. Upper West Fork Good Spring Creek (UWFGSC) represents the upstream, undisturbed background condition of the West Fork Good Spring Creek.

10. New Upper Good Spring Creek (NUGSC) represents the water quality of Good Spring Creek downstream of the confluence of the east and west forks of the creek and downstream of the South Taylor mining area.

11. Lower Good Spring Creek (LGSC) represents the water quality downstream of the South Taylor and existing mining areas.

Quarterly Surface Water Field Parameters

Temperature	Flow	pH	Conductivity

Quarterly Surface Water Laboratory Parameters

pH	Conductivity @ 25°C	Total Dissolved Solids	Total Suspended Solids
Calcium (Ca^{+2})^D	Magnesium (Mg^{+2})^D	Ammonia (NH_3)^D	Nitrate-Nitrite^D
Sodium (Na^+)^D	Sulfate (SO_4^-)^D	Arsenic (As)^{TD}	Iron - Total^D
Mercury (Hg)^{TD}	Manganese (Mn)^{TD}	Selenium (Se)^{TD}	Zinc (Zn)^{TD}
D = Dissolved TD = Total Dissolved T = Total TR = Total Recoverable			

Prior to mining at Lower Wilson, the following three surface water monitoring sites will be added to the sampling schedule:

1. Upper Wilson Creek (UWC) represents water quality upstream of all mining impacts.
2. Upper Middle Wilson Creek (UMWC) represents water quality downstream of the proposed Lower Wilson mining area.
3. Lower Wilson Creek (LWC) represents water quality immediately upstream of the confluence with Taylor Creek.

<u>Groundwater</u> – Five additional alluvial groundwater sites will be monitored, as a result of expanding mining activity into the Collom Expansion Area as described below. Please refer to Exhibit 26, Item 1 for additional details regarding the wells in the Collom Expansion Area listed below. The existing six alluvial groundwater sites will continue to be monitored to some degree. (Field parameters gathered during 1st through 4th quarters, lab samples taken during 2nd quarter only).

Monitoring Type	Monitoring Location	Monitoring Frequency	Quarterly Parameters	Annual Parameters
Alluvial Groundwater	MC-04-01[1]	Quarterly	Water level, Temperature, pH, Conductivity	See Below
Alluvial Groundwater	MC-04-02[2]	Quarterly	Water level, Temperature, pH, Conductivity	See Below
Alluvial Groundwater	MLC-04-01[3]	Quarterly	Water level, Temperature, pH, Conductivity	See Below
Alluvial Groundwater	MJ-95-01[4]	Quarterly	Water level, Temperature, pH, Conductivity	See Below
Alluvial Groundwater	MJ-95-03[5]	Quarterly	Water level, Temperature, pH, Conductivity	See Below
Alluvial Groundwater	Gossard Well[6]	Quarterly	Water level, Temperature, pH, Conductivity	See Below

Monitoring Type	Monitoring Location	Monitoring Frequency	Quarterly Parameters	Annual Parameters
Alluvial Groundwater	A-6 Well[7]	Quarterly	Water level, Temperature, pH, Conductivity	See Below
Alluvial Groundwater	North Good Spring Well[8]	Quarterly	Water level, Temperature, pH, Conductivity	See Below
Alluvial Groundwater	MT-95-02[9]	Quarterly	Water level, Temperature, pH, Conductivity	See Below
Alluvial Groundwater	A-7[10]	Quarterly	Water level, Temperature, pH, Conductivity	See Below
Alluvial Groundwater	A-8[11]	Quarterly	Water level, Temperature, pH, Conductivity	See Below

1. MC-04-01 – Located in the Collom Gulch valley fill, this site represents the condition of the Collom Gulch valley-fill aquifer adjacent to the proposed Collom Lite pit. This location is additionally designated as a "Point of Compliance" well for alluvial groundwater monitoring purposes.

2. MC-04-02 – Located in the Collom Gulch valley fill, this site represents the condition of the Collom Gulch valley-fill aquifer adjacent to the proposed Little Collom X pit.

3. MLC-04-01 – Located in the Little Collom Gulch valley fill, this site represents the condition of the Little Collom Gulch valley-fill aquifer below the proposed mining activities.

4. MJ-95-01 – Located in the West Fork Jubb Creek valley fill, this site represents the condition of the West Fork Jubb Creek valley fill aquifer adjacent to the northeast (downgradient) side of the proposed Collom Lite pit.

5. MJ-95-03 - Located in the Jubb Creek valley fill just downstream of the confluence of the West and East Forks of Jubb Creek, this site represents the condition of the valley-fill aquifer downgradient of the proposed Collom Lite pit.

6. Gossard Well – Located within alluvium beneath the rail loop, this site represents the condition of the alluvial aquifer in the vicinity of the Gossard Coal Loadout Facility.

7. A-6 Well – Located in the Good Spring Creek alluvium, this site represents the condition up-gradient of proposed and current mining activities.

8. North Good Spring Well – Located in the Good Spring Creek alluvium, this site represents the down-dip condition below existing and proposed mining activities.

9. MT-95-02 – Located in the Taylor Creek alluvium, this site represents the down-dip condition below current and proposed mining activities.

10. A-7 – Located in the West Fork of Good Spring Creek alluvium, this site represents a potential down-dip condition below South Taylor mining activities.

11. A-8 - Located in the West Fork of Good Spring Creek alluvium, this site represents the condition up-gradient of South Taylor mining activities.

For the alluvial groundwater wells, water levels and field water-quality parameters (Temperature, Water Level, pH and Conductivity) will be measured quarterly, samples for laboratory analysis will be collected annually during the second quarter utilizing the parameters listed below.

Annual Groundwater Laboratory Parameters

pH	Conductivity at 25°C	Total Dissolved Solids	Bicarbonate (HCO_3^-)^D	Calcium (Ca^{+2})^D
Magnesium (Mg^{+2})^D	Ammonia (NH_3)^D	Nitrate^D	Phosphate (PO_4^{-3} as P)^D	Sodium (Na^+)^D
Sulfate (SO_4^{-2})^D	Arsenic (As)^{TD}	Iron (Fe)^D	Lead (Pb)^{TD}	Manganese (Mn)^{TD}
Mercury (Hg)^{TD}	Selenium (Se)^{TD}	Zinc (Zn)^{TD}		
D = Dissolved TD = Total Dissolved T = Total TR = Total Recoverable				

Prior to mining at Lower Wilson, the following three alluvial groundwater monitoring sites will be added to the sampling schedule:

1. MW-95-01 – Located in the Wilson Creek alluvium, this site represents the upstream, undisturbed background conditions of the alluvial aquifer.
2. MW-05-03 – Located in the Wilson Creek and unnamed drainage alluvium, this site represents alluvial groundwater quality immediately downgradient from Lower Wilson.
3. MW-95-02 – Located in the Wilson Creek alluvium, this site represents the downgradient conditions below Lower Wilson and the proposed haul road.

Groundwater, Fill Piezometers - The West Pit Fill piezometer will be monitored quarterly for water levels. After mining, two additional piezometers will be installed into the toes of East Taylor Fill and West Taylor Fill as described in Exhibit 21 Item 1. These piezometers will be added to the monitoring program.

A future spoil water monitoring well will be drilled (and water quality monitored) as identified on Map 41B in the reclaimed Collom Lite Pit area to monitor and measure the potential development of a spoil aquifer. This location represents the lowest point in the proposed Collom Lite Pit.

Colowyo has also agreed to monitor well C-04-16 to collect information on potential impacts to bedrock groundwater quantity and quality prior to, during and post mining activities in the Collom Expansion Area. The monitoring frequency and parameters captured will mirror those established for the monitoring of alluvial groundwater wells.

Points of Compliance

POINTS OF COMPLIANCE - WATER MONITORING, RIO TINTO COLOWYO MINE

MEEKER, COLORADO

Prepared by Brant A. Dennis, C.P.G.
March 2009

When dealing with point of compliance monitoring of ground water in a mining area, the monitoring is dependent on a continuous, non-perched ground water layer/zone that can be monitored, the geologic and structural conditions, and the topography. Currently at the Colowyo Mine (CM), Meeker, Colorado, where mining started over 30 years ago, the mining zone in both the East and West Pits has not encountered any significant shallow or deep ground water, except for an occasional perched ground water. As discussed in a previous paper, no point of compliance monitoring can currently occur in the current CM mining area.

With current mining operations in the South Taylor area and, possibly, the Collom mining area, the following is presented to clarify the geologic and shallow and deep ground water conditions, to assist in determining whether point of compliance monitoring may be necessary for future mining areas.

The following is a synopsis of the data submitted in previous permit applications for South Taylor and, more recently, Collom to the Colorado Division of Reclamation, Mining and Safety. This data are then used to determine if point of compliance monitoring at the CM and proposed mining areas is possible.

Topography

The active Colowyo mine area and associated properties owned by Colowyo are located on a topographic high, known as the Danforth Hills. The elevation in the area of the CM and associated property ranges from 8400 feet on the south to 6550 feet on the north in the incised valleys. In addition, south of the topographic highs, the topography decreases in elevation before another rise to the south. The valleys, themselves, have elevation ranges from approximately 7100 feet on the south to 6550 feet on the north.

The current mine area (East, West and South Taylor pits) is bordered on the east and west by deeply incised valleys. These valleys are Good Spring Creek and Wilson Creek, on the east and west respectively. The valleys slope from south to north, with similar topographic slope as found at the higher elevations where the current mining occurs.

There are other valleys within the area of the Colowyo mining area and properties, west of Good Spring Creek. However, the headwaters of these valleys (e.g., Taylor Creek, Jubb Creek, and Collom Gulch) tend to originate in the higher elevations within the Colowyo properties. These valleys do not create deep valleys like Wilson and Good Spring Creek, which cross the topographic highs.

Geology

The current mine area and associated properties are located on the Williams Fork Formation of the Cretaceous Mesaverde Group. The Williams Fork Formation is comprised of discordant beds/units of sandstone, siltstone and mudstone and coal seams, with an approximate thickness of 1,200 to 1,300 feet in the both mine area.

The sediments in this area were deposited in a deltaic depositional environment. The geologic beds vary in thickness and lateral extent both horizontally and vertically throughout the CM area. The numerous coal seams in this formation also vary in thickness and lateral extent.

The sandstones tend to be very fine grained to fine grained and poorly sorted, with various amounts of silt and clay. For the siltstones and mudstones, theses units contain various amounts of finer and coarser materials. The formation is comprised principally of mudstones, siltstones and coals, with sandstone layers being least prevalent.

The Williams Fork Formation conformably overlies the Iles Formation. The Iles Formation is comprised of sandstones, siltstones and marine shales. At the top of the Iles Formation, and immediately below the Williams Fork Formation, is the Trout Creek Sandstone (TCSS). The TCSS is a massive, white to light gray, very fine to fine grained, moderately well sorted sandstone with a thickness of between 50 and 70 feet and is approximately 1,200 to 1,300 feet below the ground surface in the current and proposed mining areas of Colowyo. This is the only mapped and known continuous unit in the area of the CM. This sandstone has been noted as being an excellent marker bed for correlation work with the overlying coal seams.

Geologic Structure

Two major features, the Collom Syncline (on the north) and the Danforth Hills Anticline/Wilson Dome (to the south), control the primary geologic structure in the area of CM. All of the current and proposed mining areas are located between these structural features. There are two minor synclines on the eastern and western edge of the current and proposed mining areas known as the Elkhorn and Morgan synclines, respectively. (As noted above, this data and associated geologic maps can be found in the recent permit applications to DRMS).

The current mining area is located on the south flank of the Collom Syncline. The axis of the Collom Syncline, located approximately 0.5 miles north of the north edge of the reclaimed East Pit, trends west-northwest (approximately N60°W) with a slight dip in the axis to the west-northwest. The Collom Syncline is sub-parallel to the Axial Anticline to the north and the Danforth Hills Anticline on the south. The Collom Syncline is asymmetrical, with the north flank of the syncline steeply dipping (20°-40°) to the south-southwest. The south flank dips to the north-northeast at around 10°±5°. Thus, due the geologic structure of the area, the coal seams and non-coal beds dip to the north-northeast at approximately 10°. The dip of the rock on the eastern portion of the CM is partially controlled by the Elkhorn syncline located east of the CM. Although the rock still has a primary north component there is some dip to the east.

In the middle of the South Taylor mining area, a structural high, an unnamed anticline, is present, which is an offshoot of the Danforth Hills anticline. This is associated with a small-unnamed syncline near the valley floor of the West Fork of Good Spring Creek. The anticline causes the rock to dip predominantly to the north and south.

The proposed Collom mining area is located in a similar geologic setting as the current Colowyo mining area of the West Pit and the inactive East Pit.

Hydrologic Conditions

Based on the above discussion, the Colowyo active mining area and associated Colowyo properties are located on a topographic and structural high. This causes any surface or ground water to flow from a south to north direction due to slope and dip of the sediments.

In addition, the topography, structure and erosional features in the area south of the permitted areas cause the top of the Iles formation (including the TCSS) and the bottom one-half of the Williams Fork to be exposed on both sides of Wilson Creek, above the valley floor.

Bedrock Ground Water

With respect to ground water monitoring of the Williams Fork, the current mined sequence of non-coal and coal beds in the West and South Taylor Pits are above any significant recharge source, i.e., surface water recharge to the bedrock in the valleys. This is because the bottoms of the current pits are at an elevation higher than the elevation of the surface water in the valleys.

Precipitation in this area is less than 22 inches (on average) per year. Evaporation rates approach 30 inches per year. Any surface water/precipitation on the topographic highs has to percolate through the clayey soils, prevalent in the area of the CM and Collom, into the underlying bedrock. The recharge rates in the Good Spring Creek and Taylor Creek basins are estimated to be 0.35 inches per year, based on past studies. Any water that does recharge the bedrock units tends to accumulate along unit contacts since these tend to be zones of least flow resistance. This was and is exhibited in the highwall of both pits of the Colowyo Mine, where any discharge is seen as issuing primarily from these contacts and has been the case since 1981.

Any ground water that has been discharged from the mine highwall has been found to evaporate from the pit floor or be consumed by down slope (usually northern) pit highwall. Past hydrological studies also reveal the current mined units tend to have low permeabilities (even the sandstones) and do not allow for large water movement, even if the ground water is present. This is the situation whether ground water is under unconfined or confined conditions.

The projected bottom of the current South Taylor pit will be at an elevation higher than the majority of the coal seams mined in the West Pit, where only perched water has been encountered in the last 14 years. The only source of water via recharge for the mined units in the South Taylor pit is precipitation and the storage ponds that were used for cattle and sheep watering. Therefore, no monitoring of a continuous non-perched aquifer is possible, even if the beds of the Williams Fork formation were continuous over a large area.

The same geologic setting is also found in the proposed Collom mining area. The southern portion of the proposed permit area has the top portion of the Iles formation and the bottom of the Williams Fork formation exposed above Wilson Creek. Drilling in this area down to the TCSS revealed dry conditions and long term monitoring of a TCSS monitoring well revealed no water. Thus in the Collom permit area, like at the active Colowyo mining area, there is no up-gradient bedrock ground water in a continuous aquifer, which can monitored down gradient of the proposed mining area.

If any ground water does percolate vertically through the discordant geologic units, it encounters a tonstein bed near the base of the Williams Fork Formation. This bed is approximately 150 feet above the top of the Trout Creek Sandstone and is approximately 400 feet below the bottom of the active pits. The tonstein bed has an approximate thickness of 2.5 feet. Permeability tests of this material show it has permeabilities greater than 1×10^{-10} centimeters per second. Thus, this bed is an effective aquiclude and prevents downward movement of any ground water to the underlying Trout Creek Sandstone.

The monitoring of deep ground water above and below any mined area or proposed mine area is not possible. With no significant recharge of the Williams Fork formation from the south (up-dip), no ground water can be transmitted down gradient through a continuous unit, which could then be monitored.

<u>Valley Fill Ground Water</u>

As seen on the topographic maps of the Colowyo permit area (previously submitted to the DRMS), there are numerous valleys crossing the property. These valleys trend in a south to north direction following the topographic slope. These valleys include (from east to west):

- Good Spring Creek, and its tributary, West Fork Good Spring Creek
- Taylor Creek
- Wilson Creek
- Jubb Creek and its tributaries, East Fork and West Fork of Jubb Creek
- Little Collom Gulch
- Collom Gulch
- Morgan and Straight Creek

All of these creeks/gulches, except for Good Spring Creek and Wilson Creek, have their headwaters in the upper reaches of the topographic high that define the southern limits of the Colowyo active and proposed mines.

These five creeks/gulches can be classed as ephemeral, i.e., there is no water flow in the upper reaches of the valleys except for times of rainfall or snowmelt. Downstream, they could be classified as intermittent. All are feed by springs from the bedrock. These springs are prevalent in the spring and mainly disappear by late fall, thus reducing flow in the creeks and gulches to near zero or no flow conditions.

Again, like the deeper groundwater, there is no up-dip shallow ground in these valleys that can be measured for quality. Since there is no up-dip water to measure for water quality, no comparison with water from the valley fill material north of the Colowyo permit area is possible.

The headwaters of Wilson and Good Spring Creeks are located in the upper portion of the Danforth Hills, south of Colowyo. These creeks tend to be perennial with the water obtained from surface runoff from precipitation and numerous springs. As with the other creeks in the area, water flow tends to decrease in the late summer through winter.

The headwater for Good Spring Creek is near Ninemile Gap, approximately five miles south of Colowyo. This creek, as it flows to and past Colowyo, is fed by numerous valleys on the east side of the valley that transmit water into Good Spring Creek. Colowyo has no control of this water, which flows past old coal mines and over livestock grazing areas.

The major tributary on the west side of Good Spring Creek is the West Fork. This drainage starts near the Wilson Uplift (part of the Danforth Anticline) and drains to the north and east, past the South Taylor mine area. As the creek flows north, it crosses the Collom syncline and crosses both the Iles formation and the underlying Mancos Shale. When Good Spring Creek flows through the Mancos Shale, it is passing the northern portion of the Colowyo permit area.

Thus, point of compliance monitoring for ground water is not recommended since approximately half the drainage area is outside of the control of Colowyo. In addition, since the Good Spring Creek valley crosses several distinct geologic formations, water quality can be affected by this change in geology, due to the fact each formation was deposited under different circumstances, which could affect water quality.

The Wilson Creek valley has similar characteristics. However, it crosses Iles formation from the south before crossing over Williams Fork formation when it enters the southern Colowyo permit boundary. As it flows north, the creek crosses the Collom syncline and past the Iles formation and onto the Mancos Shale when it leaves the permit boundary.

Therefore, like Good Spring Creek, the geologic conditions of the area preclude point of compliance monitoring in Wilson Creek.

Water Quality

The quality of the water in the area of the CM was rated as poor by the USGS in the 1970's and the water designated for limited agricultural use. Since USGS testing in 1978, water quality analysis performed at monitoring points at the CM have not shown any significant difference in water quality compared with the initial USGS work. The water is slightly saline, alkaline and definitely classified as 'hard' water. This can be seen in the water quality measurements for total dissolved solids (TDS) and electrical conductivity (eC). Both TDS and eC exceed the EPA secondary drinking water standards.

Since the water is alkaline, the pH is above seven (7), but rarely exceeding 8.4. Concentrations of heavy metals rarely exceed health limits, as stated in the USGS report. This has also been backed up by the ground water monitoring performed since the CM began operation.

Conclusions

With respect to bedrock ground water, the current Colowyo mine area and possible future mining areas on the Colowyo property has no single or multiple continuous geologic units that contains ground water under unconfined or confined conditions. The only ground water encountered is the discontinuous perched pockets of ground water, some of which may be in saturated conditions. This lack of ground water, except for discontinuous perched ground water pockets, encountered during mining precludes the necessity to monitor ground water on a ridge top.

4.05.14 – 4.05.18 Various Topics

These sections are addressed in the original permit and will not change with addition of the Collom permit revision.

Note: Reclamation requirements contained in sections 4.06 through 4.16 of Rule 4 - Performance Standards, of the PAP are included in Appendix A of this EA.

4.17 AIR RESOURCES PROTECTION

Colowyo employs fugitive dust control measures in all phases of the mining and reclamation activities. The control measures currently used are set forth in detail in Section 2.05.6.

The operations at Colowyo are presently regulated under numerous emission permits issued by the Colorado Department of Public Health and Environment, Air Pollution Control Division. Section 2.03.10 identifies the various permits under which Colowyo currently operates. The permits are set forth in Exhibit 8 (Air Quality Information) of the original permit.

4.18 PROTECTION OF FISH, WILDLIFE, AND RELATED VALUES

Current and historical mitigation efforts, protection efforts, and habitat improvement plans are discussed in Colowyo's existing permit and Section 2.05.4. Most of these efforts have been targeted at greater sage-grouse, mule deer, elk, and raptors.

As discussed in Section 2.04.11(4), it is unlikely that any threatened or endangered species occur in the Collom permit expansion area proposed disturbance. Recently the federal status of the greater sage-grouse has changed from "Candidate for Listing" to no listing. No designated critical habitat for any species is known to exist in the permit expansion area. Golden eagles are known to nest in the permit expansion area, but the nests are located outside the area to be mined. No bald eagles are known to nest in or near the permit expansion area. Golden eagle nests and nests used by other raptor species are described in Section 2.04.11. There were eight nests used by raptor species other than golden eagles that were located within the permit expansion area. Two of these nests have recently been active (in 2006 or 2007), and were used by the long-eared owl and Cooper's hawk.

As described in Section 2.04.11(1-3), two greater sage-grouse and two Columbian sharp-tailed grouse lek sites would be indirectly impacted by mining disturbances. Based on the survey information captured and discussed previously in this submittal, the impact to the overall grouse populations in the area can reasonably be described as minor. Habitat mitigation measures for sage-grouse populations displaced during mining are discussed in Section 2.04.11(4), 2.05.4, 2.05.6(2). Map 46 has been included in this submittal to identify the locations of these high value habitat locations to demonstrate Colowyo has made efforts to avoid them where practical. The locations of possible raptor nesting sites within the proposed Collom expansion area disturbance boundary have also been included on the map. Based on the language provided within the Environmental Assessment for securing the Collom Lease Tract COC-68590, Coloywo will relocate these structures to a nearby area not targeted for disturbance. Based on the survey work previously referenced in this submittal, the sites targeted for direct impact by mining are not being heavily utilized by raptors at this time. This Map also identifies the proposed location of habitat enhancement "stockponds" that will facilitate additional opportunities for all wildlife species.

Section 4.18 of Colowyo's existing permit discusses electric power line and transmission facility construction guidelines for retrofitting of existing power poles to protect raptors. Colowyo has implemented these raptor protection measures in the Colowyo existing permit area and will also implement them in the Collom permit expansion area. Because many raptor species are predators of the Greater Sage-grouse and Colombian sharp-tailed grouse, specific restorative and enhancement activities are purposefully not being pursued beyond the protective measures described above with respect to electrical structures. Enhancement of raptor habitat in the Collom expansion area would likely lead to a lower probability of successful resumption of grouse activity post-mining.

As described in Section 2.05.6(2) and Colowyo's existing permit document, all disturbed acreage, including roads, have been kept to a minimum by proper planning to reduce impacts to all environmental resources, including impacts on wildlife.

As part of the plan to return the post-mining land use to a rangeland condition capable of supporting the diverse wildlife populations identified in the permit areas, Colowyo initiated efforts to restore wildlife habitats during pre-mine planning and early mining. This was accomplished by conducting an extensive four year study to assist in determination of the best techniques for revegetating disturbed areas with native species to enhance wildlife habitat. In addition, Colowyo implemented a habitat improvement program in 1975 to offset temporary habitat loss during mining. The reestablishment of herbaceous species, topographic relief, impoundments and limited reestablishment of a shrub component form the integral elements of the reclamation plan.

Sagebrush steppe reclamation areas specifically target sage-grouse habitat is described in Section 2.05.4.(2)(e). These areas will also serve as enhanced habitat for many other species, including mule deer and elk. Grassland reclamation areas specifically target livestock grazing but the seed mix and reclamation plan focus on ensuring plant species beneficial to wildlife will prosper as well. The nutritional value of both plant communities targeted for establishment on reclaimed lands in the Collom expansion area should be enhanced as compared to pre-mining condition based especially on increased forage availability and diversity (for both livestock and wildlife species).

To date, reclamation efforts at the existing operation have proven successful. Herds of deer and elk are regularly seen grazing on the reclaimed areas. Rodent and small game populations have reestablished on the reclaimed areas providing a readily available food source for local raptor populations and other predators. Columbian sharp-tailed grouse also use reclaimed grasslands.

4.19 PROTECTION OF UNDERGROUND MINING

Colowyo will conduct no coal mining closer than 500 feet to any point of either an active or abandoned underground mine. Underground coal mines have been operated in the past as discussed in Section 2.04.4, but their locations were on the-northern side of Streeter Draw well over 500 feet from present Colowyo mining.

The surface mining activities of Colowyo have been designed so as not to endanger any present or future operations of either surface or underground mining operations. As discussed in Section 2.05.3, Colowyo has engineered its mining plan to maximize recovery of coal by current economical surface mining methods.

4.20 SUBSIDENCE CONTROL

Colowyo is conducting a surface coal mining operation. Therefore, the requirements of 4.20 are not applicable to the Colowyo operation.

4.21 COAL EXPLORATION

All coal exploration activities within the Collom permit revision area will be completed in accordance with the requirements and procedures outlined in the existing permit document.

4.22 CONCURRENT SURFACE AND UNDERGROUND MINING

Colowyo does not plan to have concurrent surface or underground mining activities; therefore, the requirements of this Section are not applicable to this permit application.

4.23 AUGER AND HIGHWALL MINING

Colowyo does not plan to conduct auger or highwall mining activities; therefore, the requirements of this Section are not applicable to this permit application. The Colowyo mine has identified truck and shovel mining to be the most conducive method for coal extraction within the Collom Permit Expansion Area.

4.24 OPERATIONS IN ALLUVIAL VALLEY FLOORS

The field investigation described in Section 2.04.7 and 2.06.8 resulted in no identification of alluvial valley floors in the general mining area which would be adversely affected by mining operations; therefore, no special performance standards for operations in the alluvial valley floors are applicable to this mining permit application, and no protection or remedial measures are proposed for compliance to this Section.

4.25 OPERATIONS ON PRIME FARMLANDS

Since a negative determination of prime farmland was arrived at using the eligibility requirements established for prime farmland under Section 2.04.12, these performance standards do not apply to the present permit application.

4.26 MOUNTAINTOP REMOVAL

Based on the present data, no determination of mountain top removal has been made. When available, the pertinent data will be delivered to CDRMS for a determination.

4.27 OPERATIONS ON STEEP SLOPES

Operations on steep slopes within the permit expansion area are not anticipated. Should operations of steep slopes become a foreseeable action, Colowyo will submit an application for a variance from approximate original contour. Any plans to develop operations on steep slopes will follow provisions outlined within the original permit application.

4.28 FACILITIES NOT LOCATED AT THE MINESITE

This section is not applicable to the permit revision. All facilities used by Colowyo in their current operations will continue to be used for the Collom mining operations.

4.29 IN SITU PROCESSING

This section is not applicable.

4.30 CESSATION OF OPERATIONS

4.30.1 Temporary

If, for any unforeseeable circumstances, temporary cessation of mining and reclamation operations at the Colowyo operation becomes necessary for a period of thirty (30) days or more, Colowyo will submit to the Division a notice of intention to temporarily cease or abandon mining and reclamation activities. This notice will include a statement of the exact number of acres that will have been affected in the permit area prior to temporary cessation and an identification of back filling, regrading, revegetation, environmental monitoring, and water treatment activities that will continue during temporary cessation.

4.30.2 Permanent

At the permanent conclusion of surface mining operations, Colowyo will close, backfill, or otherwise permanently reclaim all affected areas. The reclamation plans are set forth in Section 2.05.5. The projected post-mining topography is set forth on the Post-mining Topography map (maps 19C).

Colowyo will remove any equipment, structures, or other facilities at the conclusion of mining activities and will reclaim the affected land.

C. SMCRA Permit Stipulations

Note: The PR–03 stipulations No. 15 - 17 shown below are in addition to 14 additional, previously approved stipulations attached to CDRMS approved permits for the Colowyo Coal Mine, including Colowyo's original SMCRA Permit No. C-1981-019, PR-02 and Permit Renewal (RN)–06. Some stipulations remain a binding part of the Colowyo Permit. Approval of Permit Revision No. 2 added Stipulation No. 2, Stipulation No. 3, Stipulation No. 4, Stipulation No. 7, and Stipulation No.10, and approval of RN-06 added stipulation No. 14, all of which remain in effect and which apply to other operations or earlier proposals within the SMCRA Permit boundary but do not apply to the Collom Project. Stipulations No. 5, No. 6, and No. 8 have been previously complied with and are no longer in effect.

The following three new permit stipulations were added for approval of PR 03:

15 PRIOR TO DISTURBANCE OF THE COLLOM FACILITIES AREA, COLOWYO MUST REEVALUATE SEDIMENT CONTROL STRUCTURES IN ACCORDANCE WITH RULES 4.05.2, 4.05.5, AND 4.05.6. IN PARTICULAR, TWO AREAS IN COLLOM THAT WERE PLANNED FOR

SAE STATUS, NAMELY THE 9.8-ACRE CORNER OF THE SHOP AREA AND THE 7.2-ACRE AREA OUTSIDE DEER DRAW, REQUIRE AN ALTERNATIVE PLAN. THESE AREAS MUST BE REMOVED FROM THE DISTURBED AREA OR RUNOFF FROM THESE AREAS MUST BE ROUTED TO SEDIMENT PONDS. THIS WILL REQUIRE RESUBMITTAL OF THE ASSOCIATED FIGURES, TEXT, AND EXHIBITS FOR SEDCAD RUNS.

16 IN ACCORDANCE WITH A RECOMMENDATION BY USFWS (BIOLOGICAL OPINION DATED OCTOBER 30, 2012), COLOWYO IS REQUIRED TO MARK WIRE FENCING NEAR AREAS OF HIGH GROUSE USAGE IN CONSULTATION WITH COLORADO DIVISION OF PARKS AND WILDLIFE.

17 THE OPERATOR SHALL SUBMIT AS MINOR REVISIONS TO THE PERMIT THE FINDINGS OF ARCHAEOLOGIC REPORTS AS REQUIRED BY PR03 PERMIT COMMITMENTS IN EXHIBIT 5, INTO THE PERMIT FOR INCLUSION INTO EXHIBIT 5 (THE CULTURAL RESOURCES INVENTORY).

II. CDRMS Approved Project Design Features and Permit Stipulations Attached to the Approved SMCRA Permit, and Revisions Proposed for Alternative B

A. Introduction

The following includes Project Design Features required under Colowyo's approved PAP that would apply to both Alternative A, the Proposed Action, and Alternative B. They are shown as subsection titles excerpted from the approved PAP and annotated as "Same as for Alternative A" under section B, below. The reader is referred to section I. B. above for the specific language for those measures excerpted from the approved PAP. Proposed revisions to seven of the CDRMS approved measures that would specifically apply to Alternative B are also included below. Existing permit stipulations that would apply to Alternative B are the same as those described in I. C. above for Alternative A and are not included below.

B. Existing Approved Project Design Features and Proposed Revisions for Alternative B

2.05.4 (2) (f-h) Disposal, Mine Openings, Water and Air Control through **2.05.6 (1) Air Pollution Control Plan** (Same as for Alternative A in I.B. above)

2.05.6 (2) Fish and Wildlife Plan

Procedures specified in the permit document starting in Volume 1, Section 2.05.6 will be followed by Colowyo to ensure minimal impacts to fish and wildlife in the proposed mining areas. At the conclusion of mining activities in the Collom area, disturbed lands will be restored in accordance with the reclamation plan. Colowyo is continuously working with the regulatory community to improve habitat restoration practices and minimize disturbances to fish and wildlife. As discussed, the Collom Mining area should not impact any species currently listed as threatened or endangered. Big game animals endemic to this area utilize habitat regionally and reclamation efforts will not target them specifically as multiple off-site habitat improvement initiatives are on-going in cooperation with CPW to improve big game animal habitat. As impacts to GRSG habitat are going to be an area of high interest for the foreseeable future, it is prudent and appropriate to manage reclamation activities to mitigate impacts to this species specifically, if not exclusively. Efforts to increase the diversity and forage productivity of reclamation units in both the existing operation and Collom area should provide a great benefit to all species impacted by the physical disturbance of mining related activities. Livestock grazing and hunting activities will be reinitiated after full bond release has been granted in the future. These tools will assist in further development of an already diverse reclamation landscape post-mining.

Impacts of Mining Operations on Wildlife Resources within the Mine Plan Area through GRSG Mitigation (Same as for Alternative A in I.B. above **except the following which has been deleted for Alternative B:** "As per Section 4.3.9 Threatened, Endangered, and Sensitive Species, page 53 of the Environmental Assessment for Lease-by-Application for the Collom Lease Tract COC-68590:

"The approval and issuance of a federal coal lease as defined in the Proposed Action would not adversely impact any sensitive wildlife species. However, environmental impacts from any surface mining activity could impact sensitive wildlife species. In general, environmental impacts to sensitive wildlife species due to surface coal mining are discussed as follows. Surface and highwall mining techniques are to extract the coal from the proposed 1406.71 acres in the proposed coal lease. Additional disturbed acreage will be involved with waste-rock disposal sites, mining facilities and access roads. Vegetation and topsoil will be completely removed and stockpiled, making the area temporarily unsuitable as wildlife habitat. This loss of habitat would be short-term in nature, as the area will be concurrently reclaimed as mining progresses and after mining operations cease. As with past operational experience both locally and regionally, it is likely that both the Greater sage-grouse and the Colombian sharp-tailed grouse would return after the rehabilitation of sagebrush and mountain shrub habitats.")**.**

Additional Mitigation Measures Recommended By CPW

During the PR 03 permitting process, Colowyo provided CDRMS with copies of the communications between CPW and Colowyo that identified additional mitigation strategies Colowyo has proposed in order to further offset disturbance in the Collom Expansion Area. CDRMS received a letter from CPW dated February 15, 2011 regarding wildlife mitigation suggestions based on the proposed disturbance area in the Collom Expansion Area. Colowyo management staff met with CPW staff on April 29, 2011 to discuss the specific mitigation issues raised by CPW's February 15, 2011 letter to CDRMS. Colowyo subsequently drafted a letter to CPW on May 4, 2011 clarifying points of agreement and providing specific proposals for additional wildlife mitigation measures. CPW responded to Colowyo's May 4, 2011 letter on May 17, 2011 in a letter further refining their recommendations. Colowyo has agreed to accommodate and is specifically identifying the following recommendations of Colowyo's May 4, 2011 letter to CPW and CPW May 17, 2011 letter to Colowyo that are not already incorporated/required by Colowyo's revised reclamation plan or other process or statute below:

<u>Greater Sage Grouse:</u>

- Colowyo has offered to evaluate current livestock grazing management practices and multiple stakeholder agreements in the Axial Basin and Morgan Creek Ranching for Wildlife areas for identification of additional opportunities to minimize impacts to and enhancement of habitat of GRSG in the area. Input from CPW will be a helpful component of these evaluations.

- Colowyo will incorporate the utilization of marking flags on perimeter fences in the Collom Expansion area to minimize incidents of GRSG mortality through grouse/fence collisions. CPW provided a letter dated July 30, 2014 which outlines the locations that Colowyo will demarcate fences to minimize GRSG impacts. Please see Figure 2.05.6-1.

- Colowyo will treat NPDES discharge ponds for mosquitos to reduce the potential of West Nile Virus transmission to local grouse populations if this treatment is not specifically precluded by CDPHE regulation of Colowyo's discharge ponds.

During a series of meetings since the approval of PR 03 between CPW, BLM, USFWS, Tri-State, and Colowyo it was determined that there would potentially be direct impacts to approximately 2,133 acres of mapped Preliminary Priority Habitat (PPH) for GRSG (GRSG) from the mining plan approved under PR 03. In addition to the direct impacts, consultation with CPW, BLM and USFWS biologists determined that indirect impacts would potentially occur up to 900 meters (2,953 feet) from the edge of disturbance. This distance was determined using several years of monitoring data from the Axial Basin where existing operations have been occurring and a number of years of recorded GRSG locations near the existing mining operations obtained through radio telemetry by CPW in cooperation with Colowyo. It was also determined that mining of the Little Collom X Pit (approved under PR 03) would cause a significant impact GRSG lek adjacent to the pit. Therefore, Colowyo agreed to relinquish mining of the Little Collom X Pit and redesigned the temporary overburden spoil pile location to significantly reduce the potential impacts to GRSG.

Based on the 900 meter distance, it was determined that there would be 2,180 acres of PPH potentially indirectly impacted. In total, there would be 4,313 acres of PPH potentially impacted both directly and indirectly by the mine plan disturbance which is being proposed under PR-04. To offset both the direct and indirect potential impacts to GRSG PPH, Colowyo has agreed reduce the mining plan by not mining the Little Collom X Pit, redesign the temporary spoil pile and relocate to create a larger buffer from an active GRSG lek, and also to implement the following GRSG mitigation measures:

- Colowyo will donate a total of 4,543 acres of Colowyo privately owned surface within PPH but outside of the permitted mine boundary in five non-contiguous parcels to CPW. This land will be managed by CPW for the preservation and maintenance of GRSG habitat in the Axial Basin in perpetuity. The land donation will become effective and CPW would assume management of these areas prior to any land disturbance activities at the proposed Collom Pit or temporary spoil pile area. A Land Donation Agreement will be signed between Tri-State/Colowyo and CPW, and will include details for the land donation along with a legal description of the area.

- Under the Land Donation Agreement with CPW, Colowyo will transfer all grazing and mineral rights held by Colowyo on those parcels to CPW, as well as the water rights to any stock watering structures located on those parcel

- Construct all sediment control structures outside of the GRSG lekking and brook rearing seasons (March 15 – May 15 and May 15 to July 15, respectively.

- Colowyo will make a one-time cash donation of $150,000 to CPW to preserve and protect the GRSG and to fund on-going research monitoring of the GRSG.

  <u>Columbian Sharp-Tail Grouse </u>(Same as for Alternative A in I.B. above)<u>:</u>

  <u>Mule Deer and Elk </u>(Same as for Alternative A in I.B. above)<u>:</u>

2.05.6 (3) (a) Protection of the Hydrologic Balance through **2.05.6 (5-6) Surface Mining near Underground Mining; Subsidence Control** (Same as for Alternative A in I.B. above)

RULE 4 – PERFORMANCE STANDARDS

4.02 SIGNS AND MARKERS

4.02.1 Specifications through **4.02.7 Topsoil Markers** (Same as for Alternative A in I.B. above)

4.03 ROADWAYS

The following sections identify roads as defined per Rule 1.04 (111).

4.03.1 Haul Roads

The Collom Haul Road will be constructed to facilitate mine traffic from the Collom primary crusher to the Gossard load out facility located northeast of the proposed pits. This approximate 6 mile long haul road will be constructed to meet the specifications and standards set forth in Rule 4.03.1 Ditches, erosion controls, and culverts will be used to minimize impacts to surrounding areas, and will be designed in such a manner to safely pass peak runoff from a 10 year, 24 hour precipitation event (Please see Exhibit 24, Item 1 – Collom Haul Road Culverts). During construction of the Collom Haul the field engineer shall determine the need for control measures during construction. Such temporary and permanent control measures would include silt fences, straw bales, straw wattles, rock check dams, or other measures such as downstream sediment ponds.

Additional design information for the Collom Haul Road is listed in the Construction Notes section of Sheet 3 of 9, on Map 25E. This road is designed to meet the applicable haul road regulations as well as internal road design guidelines while minimizing additional disturbed area and preventing environmental damage.

There are two haul roads that will be constructed out of the Collom Pit to haul overburden materials from the pit to the temporary overburden stockpile. These are shown on Map 25D and are designated as the East and West Haul Roads. These roads will be constructed to meet the applicable portions of Rule 4.03.1 for Haul Roads.

Both the East and West Haul Roads are designed to allow large mining equipment access and egress to and from the pit area, and both haul roads will allow access to the bottom of the pit. Once these haul road intercept the crest of the mining limit, these roads will be designed to meet internal road design guidelines while minimizing additional disturbed area and prevent environmental damage. All truck routes constructed within the immediate mining area will be exempt from any construction specifications, since roadways within the immediate mining pit area are not included within the code of Colorado Regulations Definition of "road" (Rule 1.04(111)). Out of pit haul roads such as those identified on Map 23B will be designed and constructed in accordance with Rule 4.03.1.

4.03.2 Access Roads

In order to obtain access to the Section 26 and Section 25 sediment ponds, access roads will be constructed as shown in Volume 20, Exhibit 7, Item 23, Figures D1 and D2. These roads will be designed to meet the standards of CDRMS Rule 4.03.2 for Access Roads. They are specifically designed to meet the minimum design requirements while minimizing additional disturbed area and preventing environmental damage. Additional discussions of this access road may be found under Section 2.05.3(3).

Use of these access roads will be for routine environmental monitoring and maintenance activities. Typical road use would consist of several trips per week by a light use vehicle using one way travel and low speed. For design information of the access roads please see Exhibit 7-23 Figures D1 and D2. Any outslopes created from the construction of this access road will be seeded with the mix listed below, post construction.

The access road cut/fill stabilization seed mix is as follows:

Western wheatgrass @	4 Lbs PLS/Acre
Mountain Brome @	4 Lbs PLS/Acre
Kentucky Bluegrass @	2 Lbs PLS/Acre
Sanfoin @	2 Lbs PLS/Acre
Total	12 Lbs PLS/Acre

Following construction, a report by a registered professional engineer shall be provided to the Division indicating that the roads have been built as designed. Following mining activities, the access roads may be request to remain in place as a private ranch road and therefore would not be reclaimed. Should the access roads be requested to remain post-mining, the applicable surface owner and Colowyo will provide the Division with a letter documenting this request at the appropriate time.

4.03.3 Light-Use Roads (Same as for Alternative A in I.B. above)

4.04 SUPPORT FACILITIES (Same as for Alternative A in I.B. above)

4.05 HYDROLOGIC BALANCE

4.05.1 General Requirements through **4.05.5 Sediment Control Measures** (Same as for Alternative A in I.B. above)

4.05.6 Sedimentation Ponds

The location, design parameters, and detailed sedimentation calculations of all planned sedimentation ponds are presented in Erosion and Sedimentation Control Plan (Exhibit 7, Item 23). The design plans and specifications for the sedimentation ponds are described in this section (Part C). All sedimentation ponds will be located as close as practical to the areas to be disturbed. Steep terrain in the upper basins precludes location of the ponds at the Collom Pit disturbance boundaries during the critical early phase of operations, necessitating down-valley locations downstream of the Collom Pit and temporary spoil pile footprint. Other methods of sediment control will be located on the reclaimed areas; these methods include the use of contour furrowing, contour drainage ditches, chisel plowing, and revegetation.

Colowyo has specifically provided information regarding Rule 4.05.9(7)(a-e) with respect to the construction of sediment ponds on the design drawings. Please see Exhibit 7-23C, Table 1 and Exh. 7-23 Figures C5 through C9.

Exhibit 7, Item 23, Part C contains calculations used to determine runoff volumes and flow rates for the theoretical 10-year, 25-year, and 100-year, 24-hour precipitation events, as well as annual sediment volumes. The precipitation data were obtained from the NOAA Atlas 2, Volume 3 for Colorado; soil types were obtained from the Soil Conservation Service, and are shown on the soils survey map (Map 5D).

The ongoing mining activities within each watershed of the permit area will create constantly changing hydrologic conditions. The design models are generally based on a static, theoretical scenario, utilizing SEDCAD 4. Please refer to Exhibit 7, Item 23 for a delineation of the areas used for these modeling purposes, the presentation of the assumed worst case scenario, as well as the maps associated with the SEDCAD runs.

The scenario used for the sedimentation ponds corresponds to an active, disturbed operation. In terms of groundwater, Colowyo's pits have remained essentially dry. Discharges from the ponds will remain in compliance with Colowyo's CDPS Discharge Permit. The use of flocculants in sedimentation ponds may also be used in accordance with the provisions of the CDPS Permit.

Sediment will be removed from all sedimentation ponds on an as needed basis or when the sediment level will not allow effective treatment of the runoff resulting from the 10-year, 24-hour precipitation event in accordance with Rule 4.05.2. Quarterly inspections will note the level of sediment in each pond. Ponds will typically be cleaned of sediment when water levels are lowest, and the least amount of precipitation is expected. The removed sediment may be used as topsoil or subsoil if it meets the suitability criteria discussed under Section 2.04.9 or placed in the backfill of the pits. The Division will be notified of this determination if the material is selected as overburden material that can be substituted for or as a supplement to topsoil.

All sedimentation ponds will be designed so that the minimum elevation at the top of the settled embankment is at least one foot above the elevation of the water surface in the pond with the emergency spillway flowing at design depth.

Colowyo will design, construct, and maintain the sedimentation ponds to prevent short-circuiting to the extent possible. As a general rule, the inflow to the ponds will be at the opposite end from the outflow area. The constructed height of the sedimentation pond embankment will be designed to allow for settling. During construction, a registered professional engineer will ensure that the appropriate embankment height is accomplished. For all sedimentation ponds, the entire embankment, including the surrounding areas disturbed by construction, will be seeded after the embankment is completed, using the Topsoil Stockpile/Pond Embankment seed mix described below. The active upstream side of the embankment where water will be impounded will be riprapped or otherwise stabilized, where necessary. Areas in which revegetation is not successful or, where rills and gullies develop, will be repaired and revegetated.

Colowyo will inspect the condition of each sediment pond, sediment trap, or future post-mining stock reservoir on a quarterly basis. All of these types of structures meet the requirements of an impoundment, and the inspection procedures will meet the requirements under Rule 4.05.9 (17). Previously, Colowyo has received a waiver from quarterly inspections for several existing stock reservoirs within the current permit area as described under Section 4.05.9. This waiver changed the inspection frequency to annual. Following construction of any future post-mining stock reservoir proposed in the Collom permit expansion area, Colowyo may request a similar waiver but until that is approved, the quarterly frequency would apply. Results of all impoundment inspections will be submitted annually.

Topsoil Stockpile/Pond Embankment Seed Mix*

Western wheatgrass @	4 Lbs PLS/Acre
Thickspike wheatgrass** @	4 Lbs PLS/Acre
Yarrow*** @	0.15 Lbs PLS/Acre

*mix may be modified as a result of an updated Reclamation Plan, currently under review.
**option to replace Thickspike wheatgrass with Beardless bluebunch wheatgrass or Sheep fescue
***option to replace Yarrow with Cicer milkvetch

4.05.7 Discharge Structures through **4.05.13 Surface and Groundwater Monitoring** (Same as for Alternative A in I.B. above)

4.05.14 – 4.05.17 Various Topics

These sections are addressed in the original permit and will not change with addition of the Collom permit revision.

4.05.18 Stream Buffer Zones

No perennial, intermittent, and ephemeral streams with a drainage area larger than one square mile are required to be protected under Rule 4.05.18, unless the Division specifically authorizes surface operations within the stream buffer zone. Stream buffer zones have been identified along Wilson Creek and Jubb Creek, as the drainage area reporting to these streams is larger than one square mile. Colowyo will be developing the Collom Haul Road which will be inside the stream buffer zone on both Wilson Creek and Jubb Creek.

The Collom Haul Road will cross Wilson Creek as shown on Map 25E Sheet 1. During construction Colowyo will install a bottomless culvert, and will employ proper best management practices (BMPs) during the construction phase in accordance with Colowyo's approved stormwater management plan, Section 401 certification, and US Army Corps 404 permit. Once construction of the road is completed, all surface water runoff from the Collom Haul Road will be directed to BMPs prior to being released.

The Collom Haul Road will also cross Jubb Creek as shown on Map 25E Sheet 1. The construction of the crossing will be similar to the Wilson Creek crossing and will utilize the same BMPs during and after construction.

As shown on Map 25E Sheet 1, the Collom Haul Road will parallel Jubb Creek. There will be once section of the haul road that will be within 100 feet of the stream. As shown on Map 25E Sheet 1, at approximately Station 140+00 there will be about 140 feet of proposed disturbance within the stream buffer zone on Jubb Creek. Proper BMPs will be employed prior to any disturbance occurring within this area and once the road construction is complete any areas that can be reclaimed will be completed as soon as possible.

It is not anticipated that any of the three areas that are proposed to be disturbed within the stream buffer zone will have any short or long term impacts to Wilson or Jubb Creek due to proper use of BMPs, and due the fact the disturbance will be immediately offset by reclamation when construction of the road is complete.

No other areas are within the Collom disturbance footprint will impact any stream buffer zones.

Note: Reclamation requirements contained in sections 4.06 through 4.16 of Rule 4 - Performance Standards, of the PAP are included in Appendix A of this EA.

4.17 AIR RESOURCES PROTECTION through 4.22 CONCURRENT SURFACE AND UNDERGROUND MINING (Same as for Alternative A in I.B. above)

4.23 AUGER AND HIGHWALL MINING

Colowyo does plan to conduct highwall mining activities; therefore, the requirements of this Section will be revised through the technical revision process prior to initiating any highwall mining in the Collom mining area.

4.24 OPERATIONS IN ALLUVIAL VALLEY FLOORS through 4.28 FACILITIES NOT LOCATED AT THE MINESITE (Same as for Alternative A in I.B. above)

4.30 CESSATION OF OPERATIONS (Same as for Alternative A in I.B. above)

4.30.1 Temporary (Same as for Alternative A in I.B. above)

4.30.2 Permanent (Same as for Alternative A in I.B. above)

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Appendix C

Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
445 West Gunnison, Suite 240
Grand Junction, Colorado 81501-5711

IN REPLY REFER TO:
ES/GJ-6-CO-16-F-006
TAILS 06E24100-2016-F-0031

April 22, 2016

Memorandum

To: Supervisor, Program Support Division, Field Operations Branch, Office of Surface Mining Reclamation and Enforcement, Denver, Colorado

From: Western Colorado Supervisor, Fish and Wildlife Service, Ecological Services, Grand Junction, Colorado

Subject: Reinitiation of Consultation for the Colowyo Coal Company, L.P. "Colowyo" Mine, Permit C-81-019 – Collom Permit Expansion Area, Permit Revision -04

This memorandum and the attached Biological Opinion (BO) responds to the Office of Surface Mining Reclamation and Enforcement (OSMRE) request for reinitiation of consultation with the Fish and Wildlife Service (Service) on effects of the subject project to species and habitats listed under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.; [Act]). OSMRE's request dated December 9, 2015, included a biological assessment (BA) entitled *Reinitiation of Consultation for the Colowyo Coal Company, L.P. "Colowyo" Mine, Permit C-81-019 – Collom Permit Expansion Area, Permit Revision PR-04*, dated December 1, 2015 (OSMRE 2015a). OSMRE analyzed the effects from the subject project to a number of listed species in the 2015 BA and in an earlier 2012 BA (see Consultation History below); the final determinations of OSMRE for the project are presented below.

Species	Listing status	Determination
Colorado pikeminnow (*Ptychocheilus lucius*)	endangered, critical habitat	likely to adversely affect
Razorback sucker (*Xyrauchen texanus*)	endangered, critical habitat	likely to adversely affect
Humpback chub (*Gila cypha*)	endangered, critical habitat	likely to adversely affect
Bonytail (*Gila elegans*)	endangered, critical habitat	likely to adversely affect
Western yellow-billed cuckoo (*Coccyzus americanus*)	threatened	not likely to adversely affect
Western yellow-billed cuckoo (*Coccyzus americanus*)	proposed critical habitat	not likely to destroy or adversely modify

In addition to the species listed above, effects to other listed species were analyzed in the original consultation, as described in the Consultation History section below and in the BA. OSMRE determined none of the other species would be affected by the subject project. Therefore, reinitiation of consultation was not requested and is not necessary for these species.

The Service has prepared a BO with a finding that the proposed project is not likely to jeopardize the four endangered fish, nor is it likely to destroy or adversely modify their critical habitats (attached). We also concur (below) with OSMRE's determinations for the western yellow-billed cuckoo (cuckoo) and its proposed critical habitat.

For the Mexican spotted owl (*Strix occidentalis lucida*), black-footed ferret (*Mustela nigripes*), Canada lynx (*lynx canadensis*), Dudley Bluffs twinpod (*Physaria obcordata*), Ute ladies'-tresses orchid (*Spiranthes diluvialis*), and greenback cutthroat trout (*Oncorhynchus clarki)*, we acknowledge your determination of no effect, but neither 7(a)(3) of the Act, nor implementing regulations under section 7(a)(2) of the Act require the Service to review or concur with this determination; therefore the Service will not address these species further. However, we do appreciate you informing us of your analyses for these species.

Concurrence for western yellow-billed cuckoo and its proposed critical habitat

No cuckoos have been found at or near the Colowyo Mine or the Craig Generating Station. Cuckoo habitat is not present at or near these facilities. Critical habitat has been proposed for the western yellow-billed cuckoo (79 FR 48547), including a unit along the Yampa River between the towns of Craig and Hayden. Cuckoos and their proposed critical habitat are found within the airshed analyzed for mercury deposition from the Craig Generating Station, as outlined in the BA and discussed in our BO below.

We have records of only six cuckoos from the Yampa proposed critical habitat unit. The most recent observation was from 2015. We do not know whether any of these cuckoos were nesting or not. There is potential for contamination of cuckoo insect prey items and habitats from mercury emissions from the Craig Station. However, we have no data on mercury levels from cuckoos or their prey in this area. Aquatic insects are more likely to accumulate mercury from the environment than terrestrial insects due to the mercury methylation process which takes place in the presence of anoxic lentic environments (Sandheinrich and Wiener 2011). Aquatic insects (e.g., dragonflies, caddisflies) are only a minor component of a cuckoo's diet (79 FR 48587).

Although the boundary of the Yampa proposed critical habitat unit has been identified and mapped, additional information on the spatial arrangement of the physical and biological features within the unit would improve conservation planning for the cuckoo. As described in the BA, Colowyo will fund an effort to delineate which portions of proposed critical habitat along the Yampa River contain these different habitat features. This mapping effort will refine our knowledge of the habitat composition of the unit and improve targeting of future occupancy surveys. Colowyo will have a habitat mapping methodology developed and implemented in coordination with the Service. The relevant scientific literature will be reviewed to determine the vegetation component, distance to water, and patch size requirements for the western yellow-billed cuckoo. Data used would come from existing data sets already developed and available including the latest aerial imagery (of primary importance), Southwest Regional Gap Analysis habitat data, The Nature Conservatory, Colorado Parks and Wildlife (CPW) habitat suitability data, and any other currently available agency data, as needed. 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 mapping effort would produce a report on established methods, results, and GIS mapping classification of the proposed critical habitat into areas of nesting, foraging, and other habitats. Colowyo will fund the mapping effort at a cost not to exceed $10,000.00. A preliminary habitat map of the Yampa unit will be prepared by June 15th, 2016, prior to the start of cuckoo survey season. The final project would be completed by mid-summer, 2016, but no later than August 31, 2016.

You have determined that your proposed action may affect, but is not likely to adversely affect the cuckoo. You have also determined that your proposed action is not likely to destroy or adversely modify proposed critical habitat for the cuckoo. We concur with your determinations. We base our concurrence on the rationale provided in the BA and additional Service review and analysis. We would like to point out, however, that many questions remain regarding the cuckoo's status and the potential contaminant levels in the action area; new information could lead to different conclusions in the future.

We conclude informal consultation under section 7 of the Act for the cuckoo and its proposed critical habitat. Further consultation pursuant to section 7(a) (2) of the Act is not required at this time. As provided in 50 CFR §402.16, reinitiation of formal consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If the amount or extent of taking specified in the incidental take statement is exceeded; (b) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (c) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the BO; or (d) If a new species is listed or critical habitat designated that may be affected by the identified action.

In accordance with section 7 of the Act and its implementing regulations, this BO incorporates the best scientific and commercial information available on the effects of the proposed action to federally listed species and their critical habitats, including from the mining and combustion of coal resulting in mercury and selenium emissions and subsequent deposition and accumulation in listed species within the Yampa and White River Basins. A complete record of this consultation is on file at the Service's Western Colorado Ecological Services Field Office, in Grand Junction, Colorado.

If you have questions regarding this consultation, please contact Creed Clayton at (970) 628-7187.

BIOLOGICAL OPINION
On effects to the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail from the mining of Federal coal at the Colowyo Coal Mine–Collom Permit Expansion Area, Permit Revision-04, and subsequent combustion of the coal at the Craig Generating Station

TAILS No. 06E24100-2016-F-0031

Colorado pikeminnow (*Ptychocheilus lucius*)

FISH AND WILDLIFE SERVICE
Mountain Prairie Region
Grand Junction, Colorado

Western Colorado Supervisor, Ecological Services ____________

Date 4/22/16

Purpose of this Document

In 1973, Congress passed the Endangered Species Act (ESA) in order to "...*provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved*..." (ESA section 2). Included in section 7 of that Act, is the requirement that every federal agency must insure that any action "…*authorized, funded, or carried out… is not likely to jeopardize the continued existence of any endangered or threatened species*…". To meet this requirement, Congress required that the action agencies request assistance from the U. S. Fish and Wildlife Service (Service) and seek their biological opinion (BO) regarding whether the proposed action is likely to jeopardize the continued existence of a listed species.

This document, is that required examination of the OSMRE's proposed action (approval of a mining plan) and the Service's BO on the proposed action's effects to the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail (four endangered fish). This BO also determines whether the proposed action would destroy or adversely modify critical habitats for the four endangered fish.

This BO relies on the newly revised (2016) regulatory definition of "destruction or adverse modification" of critical habitat (Federal Register, February 11, 2016, Volume 81, No. 28 p. 7226), which states, "*Destruction or adverse modification* means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features."

Background

As a result of a legal challenge (*WildEarth Guardians v. U.S. Office of Surface Mining et al.*, Case 1:13-cv-00518-RBJ (D. Colo. 2015)), the District Court of Colorado required the Office of Surface Mining and Reclamation Enforcement (OSMRE) to review their approval of mining plans at the Colowyo and Trapper Mines in Moffat County, Colorado (including any effects from the action of mining plan approval) and complete additional analysis under the National Environmental Policy Act (NEPA). Among other things, the court's findings indicated that the indirect effect of combustion at the Craig Generating Station, where the coal would be burned, from coal mined under the plan should be considered as "reasonably foreseeable" under NEPA and should be included in the NEPA analysis. The Court's direction to explore those indirect effects under NEPA had the unintended consequence of leading to an examination of these effects under section 7 of the ESA.

Indirect effects under regulations implementing section 7 of the Act are defined as "...those that are caused by the proposed action and are later in time, but still are reasonably certain to occur." (Emphasis added.) This definition differs from the NEPA phrase "reasonably foreseeable." This difference may reflect a distinction between the procedural nature of NEPA vs. the substantive nature of section 7 and is touched on briefly in the Federal Register notice finalizing the 1986 regulations on conducting section 7 consultation (FR June 3, 1986, Volume 51, No. 106, p. 19933).

OSMRE does not have discretion or authority over determining where the Colowyo mined coal is taken to be combusted. It also does not have discretion or authority regarding the manner in which the coal will be combusted. In the past, the Tri-State Generation and Transmission Association, Inc. (Tri-State), has made the decision to purchase this coal (along with coal from other sources) and combust it at the Craig Generating Station to produce power. The decision space in between OSMRE's plan approval and the combustion of the coal at the Craig Generating Station may make the causal connection somewhat less than reasonably certain. However, OSMRE has assumed (for analysis) the causal connection for indirect effects. The Service therefore, will base our analysis on that assumption.

Consultation History

A first draft biological assessment (BA) was delivered to the Service on July 23, 2015. The Service returned comments the next day on July 24, 2015. Another draft was delivered to the Service on July 31, 2015. The Service returned comments on August 3, 2015. The "final" BA and request for formal consultation was received on August 6, 2015. The Service pointed out a few additional needs for correction; as a result a revised request for consultation was received on August 7, 2015, and the revised final BA was received in our office on August 13, 2015 (BA still dated August 5, 2015).

The original August 6 consultation request was for two mining areas at the Colowyo Mine--the Collom Expansion area and the South Taylor/Lower Wilson area. On August 21, 2015, OSMRE determined that it was appropriate to revise the project description and consultation request, separating consideration of the Collom expansion area from the South Taylor/Lower Wilson area. A new consultation request was received on August 26, 2015, that was only for coal mined at the South Taylor/Lower Wilson mining area. We issued a BO to OSMRE for the South Taylor/Lower Wilson mining area on August 27, 2015 (Service 2015a).

This current section 7 consultation is a reinitiation of a past consultation involving the Collom expansion area at the Colowyo Mine. Section 7 consultation was originally initiated in 2012 on the impacts associated with mining and reclamation operations at the Collom expansion area by Colowyo, the project applicant. The Service responded on October 30, 2012, (Appendix A in BA) addressing the proposed 36 acre-feet of additional water depletions from the upper Colorado River system, which would adversely affect the four endangered fish and their critical habitats. No other threatened or endangered species were determined to be adversely affected.

The water depletion quantity analyzed in the 2012 BO has not changed with the expanded project description that is the subject of this consultation. Given that the amount of water to be depleted has not changed, and the effects of those water depletions has not changed, water depletions are not addressed further in this BO. We reexamined the information and our conclusions contained in the 2012 BO and find that they remain valid.

As further discussed below, this BO addresses the effects to the four endangered fish and their critical habitats from contaminants released from coal combustion and mine discharge, which were not previously addressed.

Past consultations involving water depletions and their effects on endangered fish from operation of the Craig Generating Station were also conducted with the Rural Electrification Administration (REA) within the United States Department of Agriculture (USDA). On March 13, 1980, the Service issued a BO on the depletion of 6,400 acre-feet/year of water from the Yampa River for operation of the Craig Station Unit 3 Power Plant. To satisfy requirements of the 1980 BO, a water management plan was developed, including limited water diversions during baseflow conditions. The final water management plan was approved on April 15, 1992, and the Service stated that, with implementation of the water management plan, operation of the Craig Station Unit 3 power plant was not likely to jeopardize the continued existence of the endangered fishes. Section 7 consultation for Units 1 and 2 was carried out in 1973-1974.

1.0 PROPOSED ACTION (as described in the BA)

The Proposed Action includes future mining at the Collom expansion area, and the interrelated activity of burning the mined coal at the Craig Generating Station. OSMRE does not have discretion or authority over determining where the mined coal is taken to be combusted. It also does not have discretion or authority regarding the manner in which the coal will be combusted. In the past, the coal has been combusted at the Craig Generating Station. This decision space in between the OSMRE plan approval and the combustion of the coal at the Craig Generating Station makes the causal connection less than reasonably certain. However, for this section 7 consultation, OSMRE is assuming that the approval of the Colowyo mining plans would logically lead to mining and local combustion of the coal, therefore those potential impacts of burning coal at the Craig Generating Station, which would be mined from the Collom expansion area at the Colowyo Mine, are included in this consultation.

Reinitiation of consultation with the Service for the coal mining project at the Colowyo Mine was requested by OSRME because the effects to listed species stemming from coal combustion, as an indirect effect of mining, were not previously analyzed. In the BA OSMRE finds that combustion of the coal mined at the Colowyo Mine is a reasonably foreseeable future action. However, the Colowyo Mine and the Craig Generating Station are independent operations with independent utility; Colowyo could sell coal to a different power plant, and the Craig Generating Station could and does purchase coal from different mines.

The Colowyo Mine, located approximately 10 miles south of the Yampa River along the Moffat-Rio Blanco county border, is not located near suitable habitat for the endangered fish. The Craig Generating Station is located approximately 1.1 miles south of the Yampa River just downstream from the town of Craig, and near the upper end of critical habitat designated for the Colorado pikeminnow. Further details regarding the Collom expansion area and proposed action can be found in the BA.

1.1 Action Area

The description of action area is informed by the following definitions.

3

Action – "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies….. or (d) actions directly or indirectly causing modifications to the land, water, or air." (50 C.F.R. § 402.02)

Action Area – "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." (50 C.F.R. § 402.02)

Effects of the action – *" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline… .* **Indirect effects** *are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.* **Interrelated actions** *are those that are part of a larger action and depend on the larger action for their justification.* **Interdependent actions** *are those that have no independent utility apart from the action under consideration.*" (50 C.F.R. § 401.02) [Emphasis added]

Based on the area where "modifications to the land, water, or air" (directly or indirectly) from this proposed action occur and can be perceived, the action area for this BO covers: 1) the Colowyo Mine, 2) the topographic mercury deposition airshed (airshed) (Figure 7 in BA), and 3) the Colorado River Fish Analysis Area (Figure 7 in BA), which includes the Yampa and White Rivers within, adjacent to, and downriver from, the airshed. This includes the critical habitats designated for all four endangered fish species found along the Yampa and White Rivers down to where each meets the Green River. The airshed encompasses the Colowyo Mine and Craig Generating Station and was delineated using topographic features. It extends out approximately 25-50 miles from the Craig Generating Station, and generally encompasses the area from Steamboat Springs west nearly to Dinosaur National Monument, and from the town of Meeker north to the Elkhead Mountains. The airshed includes portions of Moffat, Rio Blanco, Routt, and Garfield Counties. Examining air quality through a topographic airshed methodology allows for an assessment that utilizes the theoretical motion of the atmosphere, the blocking features of local topography and the location of emissions sources.

1.2 Mining

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 (OSMRE 2015b).

According to the BA, mining in the Collom expansion area (PR-04) would remove approximately 78 million tons of coal. At a production rate of 5.0 million tons per year, this would result in mining within the expansion area for approximately 15 years. Mining coal here involves one open pit--the Collom Lite Pit, spoil stockpiles, roads, mine facilities, diversion ditches, and sediment ponds.

1.3 Coal Combustion

The destination of the coal, once mined, is not under the jurisdiction of OSMRE. However, much of the coal produced at the Colowyo Mine (South Taylor and West pits) since 2008 has been sent to the Craig Generating Station in Craig, Colorado. For the purposes of analysis for this consultation, the BA assumes that all coal from the Collom expansion area would be combusted at the Craig Generating Station. The Craig Generating Station is a coal burning power plant that was constructed between 1974 and 1984 (Units 1, 2, and 3 were completed in 1980, 1979, and 1984 respectively). It generates approximately 1,303 megawatts at peak capacity (OSMRE 2015a).

Combustion of coal releases the following pollutants: sulfur dioxide, particulate matter, nitrogen oxides (NOx), mercury (Hg), selenium, and carbon dioxide. The Craig Generating Station, along with all coal fired power plants, has measures in place that reduce mercury and other emissions. Environmental control equipment at the station includes:

- Wet limestone scrubbers on Units 1& 2 to remove sulfur dioxide.
- Fabric filter "baghouse" on all Units to control particulate matter.
- Dry limestone scrubber on Unit 3 to remove sulfur dioxide.
- Low nitrogen oxide burners with over fire air on all three Units.
- Mercury emission control on Unit 3, installed in 2014/2015. (Units 1 and 2 do not require mercury controls as they qualify as low emitters under the Environmental Protection Agency's (EPA) Mercury and Air Toxics Standards (MATS) rule for power plants.)

Selective Catalytic Reduction (SCR) emission controls are also planned to be constructed on Units 1 and 2 for NOx reduction by 2021 and 2018 respectively. While not specific to mercury, the SCRs will provide the additional benefit of capturing some mercury before it is emitted. However, the amount captured is not known. Selective Non-Catalytic Reduction is also planned to be installed on Unit 3 for NOx reduction by 2018 (OSMRE 2015a).

As stated in the BA, emissions of sulfur dioxide, nitrogen oxides, and particulates are not expected to affect listed species in the action area. We agree. Of the contaminants listed above, mercury is of greatest concern for endangered fish, which is discussed further in the Effects of the Action section along with Selenium. The emissions information that follows here therefore pertains to mercury and selenium.

1.4 Applicant Committed Conservation Measures

Conservation measures are actions that will be taken by the Federal agency or applicant, and serve to minimize or compensate for, project effects on the species under review. As part of the proposed action, Colowyo has committed to the conservation measures below that are intended to advance the scientific information on the potential effects of coal combustion to the affected species. Also included are measures intended to improve the status of the four endangered fish by supporting the recovery program established for the conservation of these species.

These broad conservation measures are not project specific, but provide a programmatic approach to address the potential harm related to combustion emissions. These conservation measures will provide a basis for better understanding the nature of the threats to the species from combustion emissions and are intended to provide conservation measures applicable to impacts from current and future projects proposed by Colowyo, for which OSMRE has initiated or completed review, at the existing, state-permitted Colowyo Mine.

The following conservation measures will be implemented for the direct benefit and ultimate conservation of the endangered Colorado River fish in the Yampa and White River basins. By being included in the proposed action these conservation measures are now mandatory commitments of the project proponent. As described in the BA, the applicant has committed to the following conservation measures:

1) ***Species Preservation and Recovery Actions Funding.*** Colowyo will contribute $50,000 to the National Fish & Wildlife Foundation (NFWF) to implement recovery actions overseen by the Recovery Program. This measure would directly benefit the endangered Colorado River fish species in the two rivers impacted by mining and combustion of coal mined at the Colowyo Mine. Funding will be provided within 30 days of receipt of the September 2, 2015, PR-02 mining plan modification approval from OSMRE. 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 in the action area such as habitat improvement.

2) ***Mercury Deposition Modeling.*** Due to the uncertainty of understanding about where all of the mercury that is being deposited into the Yampa and White River Basins originates from, Colowyo and their parent organization Tri-State, have committed to funding a study to further develop the knowledge of mercury 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 Power Research Institute (EPRI) will conduct an air quality deposition modeling analysis to determine the sources of mercury being deposited in the Yampa and White River basins in northwest Colorado. 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 will be determined from modeling conducted at multiple geographic scales: global, regional and local. As done by EPRI in the San Juan River Basin (EPRI 2014), a global mercury model, GEOS-Chem (Goddard Earth Observing System Chemistry), will be applied to provide concentrations of mercury in the United States due to distant sources. The Community Multiscale Air Quality model and the Community Multi-scale Air Quality - Advanced Plume Treatment model will be used by EPRI to simulate emissions and deposition at a finer scale. At the local level individual sources will 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 will be identified in the local scale modeling.

The deposition modeling and source attribution analysis for the Yampa and White River basins will be conducted similar to the deposition modeling and source attribution analysis performed for the San Juan River Basin Project in the Four Corners region (EPRI 2014). The analysis will consider anthropogenic and natural sources of mercury deposition and will model the transport, chemical transformation and deposition of mercury under both wet and dry conditions. Colowyo will fund the deposition modeling analysis to an amount not to exceed $224,000.00. The modeling effort was initiated in September 2015 and will be completed by September 2017. Information gathered from this modeling effort will fill an obvious gap in the information available for the protection of the endangered Colorado River fish species from combustion-related contaminants. Results of the study will aid in planning for the recovery of endangered fish and other listed species potentially affected by mercury contamination in the Yampa and White River Basins.

2.0 STATUS OF THE SPECIES AND CRITICAL HABITAT

The purpose of this section is to summarize the best available information regarding the current range-wide status of the four listed fish species. Additional information regarding listed species may be obtained from the sources of information cited for these species. The latest recovery goals for all four endangered fish, which provide information on species background, life history, and threats, can be found on the internet at: http://www.coloradoriverrecovery.org/documents-publications/foundational-documents/recovery-goals.html.

2.1 Colorado Pikeminnow

2.1.1 Species description

The Colorado pikeminnow is the largest cyprinid fish (minnow family) native to North America and evolved as the main predator in the Colorado River system. Individuals begin consuming other fish for food at an early age and rarely eat anything else. It is a long, slender, cylindrical fish with silvery sides, greenish back, and creamy white belly (Sigler and Sigler 1996). Historically, individuals may have grown as large as 6 feet (ft) long and weighed up to 100 pounds (estimates based on skeletal remains) (Sigler and Miller 1963), but today individuals rarely exceed 3 ft or weigh more than 18 pounds (lbs) (Osmundson et al. 1997).

The species is endemic to the Colorado River Basin, where it was once widespread and abundant in warm-water rivers and tributaries from Wyoming, Utah, New Mexico, and Colorado downstream to Arizona, Nevada, and California. Currently, wild populations of pikeminnow occur only in the Upper Colorado River Basin (above Lake Powell) and the species occupies only 25 percent of its historic range-wide habitat (Service 2002b). Colorado pikeminnow are long distance migrators, moving hundreds of miles to and from spawning areas, and requiring long sections of river with unimpeded passage. They are adapted to desert river hydrology characterized by large spring peaks of snow-melt runoff and low, relatively stable base flows.

The Office of Endangered Species first included the Colorado pikeminnow (as the Colorado squawfish) in the List of Endangered Species on March 11, 1967 (32 FR 4001). It is currently protected under the ESA as an endangered species throughout its range, except the Salt and Verde River drainages in Arizona. The Service finalized the latest recovery plan for the species in 2002 (Service 2002b), but is currently drafting an updated revision.

The Service designated six reaches of the Colorado River System as critical habitat for the Colorado pikeminnow on March 21, 1994 (59 FR 13374). These reaches total 1,148 miles (mi) as measured along the center line of each reach. Designated critical habitat makes up about 29 percent of the species' historic range and occurs exclusively in the Upper Colorado River Basin. Portions of the Colorado, Gunnison, Green, Yampa, White, and San Juan Rivers are designated critical habitat. The primary constituent elements of the critical habitat are water, physical habitat, and the biological environment (59 FR 13374).

Water includes a quantity of water of sufficient quality delivered to a specific location in accordance with a hydrologic regime required for the species. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. This includes oxbows, backwaters, and other areas in the 100-year floodplain that provide access to spawning, nursery, feeding, and rearing habitats when inundated. The biological environment includes food supply, predation, and competition from other species.

Recovery of Colorado pikeminnow in the Colorado River Basin is considered necessary only in the Upper Colorado River Basin (above Glen Canyon Dam, including the San Juan, and Green River subbasins) because of the present status of populations and because existing information on Colorado pikeminnow biology support application of the metapopulation concept to extant populations (Service 2002b). As a result, this BO will focus on the status of the Colorado pikeminnow in that unit.

2.1.2 Life history

The Colorado pikeminnow requires relatively warm waters for spawning, egg incubation, and survival of young. Males become sexually mature at approximately 6 years of age, which corresponds to a length of about 400 millimeters (mm) (17 inches (in.)), and females mature 1 year later (Sigler and Sigler 1996).

Mature adults migrate to established spawning areas in late spring as water temperatures begin to warm, with migration events up to 745 river kilometers round-trip on record (463 mi) (Bestgen et al. 2005). Spawning typically begins after peak flows have subsided and water temperatures are above 16° Celsius (°C) (60.8° Fahrenheit (°F)). Mature adults deposit eggs over gravel substrate through broadcast spawning and eggs generally hatch within 4 to 6 days (multiple references in Bestgen et al. 2005). River flows then carry emerging larval fish (6.0 to 7.5 mm long (0.2 to 0.3 in.)) downstream 40 to 200 km to nursery backwaters (25 to 125 mi), where they remain for the first year of life (Service 2002b).

Colorado pikeminnow reach lengths of approximately 70 mm by age 1 (juveniles) (2.8 in.), 230 mm by age 3 (subadults) (9 in.), and 420 mm by age 6 (adults) (16.5 in.), with mean annual growth rates of adult and subadult fish slowing as fish become older (Osmundson et al. 1997). The largest fish reach lengths between 900 and 1000 mm (35 to 39 in.); these fish are quite old, likely being 47 to 55 years old with a minimum of 34 years (Osmundson et al. 1997).

Reproductive success and recruitment of Colorado pikeminnow is pulsed, with certain years having highly successful productivity and other years marked by failed or low success (Service 2002b). The most successful years produce a large cohort of individuals that is apparent in the population over time. Once individuals reach adulthood, approximately 80 to 90 percent of adults greater than 500 mm (20 in.) survive each year (Osmundson et al. 1997; Osmundson and White 2009). Strong cohorts, high adult survivorship, and extreme longevity are likely life history strategies that allow the species to survive in highly variable ecological conditions of desert rivers.

2.1.3 Population Dynamics

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 found only in the upper basin of the Colorado River (above Lake Powell). Three wild populations of Colorado pikeminnow are found in about 1,090 miles of riverine habitat in the Green River, upper Colorado River, and San Juan River subbasins (Service 2011a).

We measure population dynamics of Colorado pikeminnow separately in the Green, upper Colorado, and San Juan River basins because distinct recovery criteria are delineated for each of these three basins. In the 2002 recovery plan, preliminary abundance estimates for wild adults in the basins were: upper Colorado River, 600 to 900; Green River, 6000 to 8000; and San Juan River, 19 to 50 (Service 2002b).

UPPER COLORADO RIVER

To monitor recovery of the Colorado pikeminnow, the Recovery Program conducts multiple-pass, capture-recapture sampling on two stretches of the upper Colorado River which are roughly above and below Westwater Canyon (Osmundson and White 2009). In their most recent summary of those data (Osmundson and White 2013, in draft) the principal investigators conclude that during the 19-year study period [1992-2010], the population remained self-sustaining.

The current downlisting demographic criteria for Colorado pikeminnow (USFWS 2002b) in the Upper Colorado River Subbasin is a self-sustaining population of at least 700 adults maintained over a 5-year period, with a trend in adult point estimates that does not decline significantly. Secondarily, recruitment of age-6 (400–449 mm TL), naturally produced fish must equal or exceed mean adult annual mortality (estimated to be about 20 percent). The average of all adult estimates (1992 – 2010) is 644. The average of the five most recent annual adult population estimates is 658. Osmundson and White (2014) determined that recruitment rates were less than annual adult mortality in six years and exceeded adult mortality in the other six years when sampling occurred. The estimated net gain for the 12 years studied was 32 fish $\geq$ 450 mm TL.

Whereas the Colorado River population may meet the trend or 'self-sustainability' criterion, it has not met the abundance criteria of 'at least 700 adults' during the most recent five year period. Updated graphs of Colorado pikeminnow abundance in the Colorado River are shown in Figure 1 (adults) and Figure 2 (subadults) (Service 2015b).

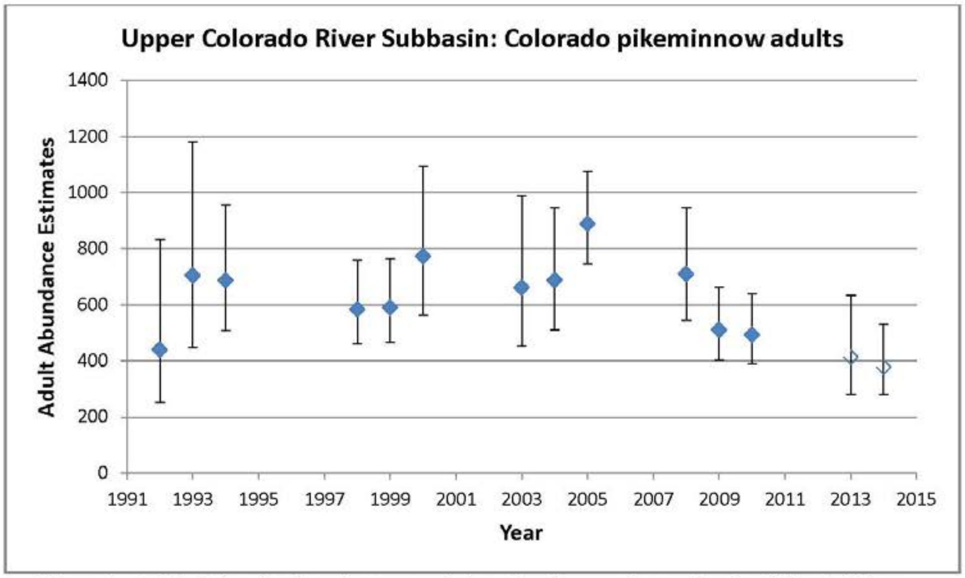

Figure 1. Adult Colorado pikeminnow population abundance estimates for the Colorado River (Osmundson and Burnham 1998; Osmundson and White 2009; 2014). Error bars represent the 95 percent confidence intervals. The 2013 and 2014 data are preliminary and represented by hollow data points.

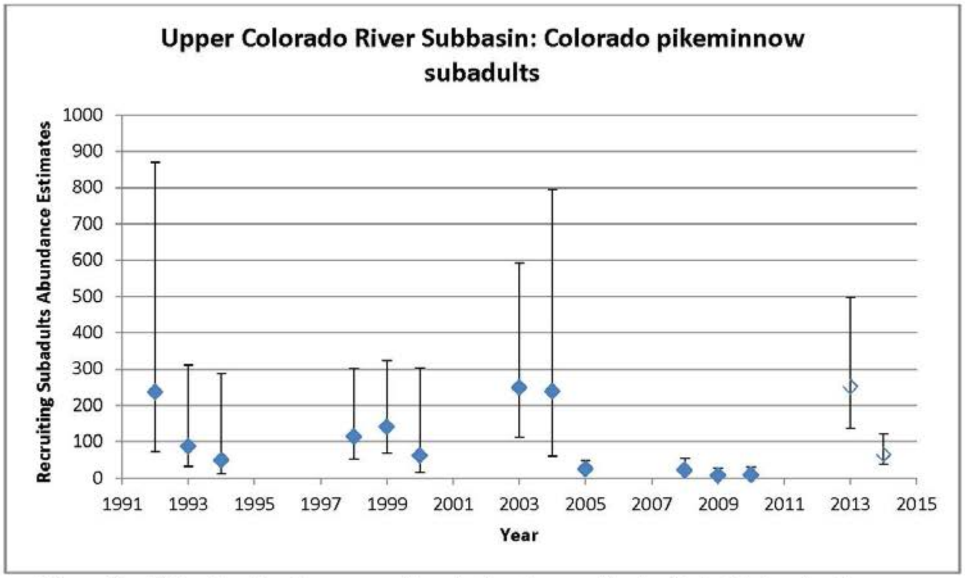

Figure 2. Colorado pikeminnow recruitment abundance estimates (calculated using the same mark recapture methodology as for the adults) for the Colorado River (Osmundson and White 2009, 2014; Service 2015b). Recruits are age-6 (400-449mm TL). Error bars represent the 95 percent confidence intervals. The 2013 and 2014 are preliminary and represented by hollow data points.

To summarize, in the Upper Colorado River Subbasin, the Colorado pikeminnow subpopulation may be self-sustaining, but the number of adults is below the level needed for recovery. Recruitment is quite variable over time, but has exceeded adult mortality in approximately half of the years when measured over the past two decades. The number of age-0 (young of year) Colorado pikeminnow is also quite variable over time, but appears to be less, on average, since the year 2000 than prior to 2000 (Figure 5). Colorado pikeminnow are also generally distributed throughout the Colorado River now to the same extent that they were when they became listed.

GREEN RIVER

Population estimates for adult Colorado pikeminnow in the Green River subbasin began in 2000. Sampling occurs on the mainstem Green River from the Yampa confluence to the confluence with the Colorado River and includes the Yampa and White Rivers. The initial year of sampling did not include the lower Green River (near the confluence of the White River to the confluence with the Colorado River). Beginning in 2001, the sampling regime has consisted of three years of estimates followed by two years of no estimates (Bestgen et al. 2005). The first set of estimates showed a declining trend; however, estimates collected in 2006–2008 showed an increasing trend approaching the level of the estimate made in 2000 (Figure 3) (Bestgen et al. 2010). Data from the third round (2011–2013) of population estimates for the Green River subbasin are still being analyzed (thus no confidence intervals are shown for the 2011–2013 estimates in Figure 3) (Bestgen et al. 2013). Preliminary results from Bestgen (2013) analysis indicate adults and sub-adults are decreasing throughout the entire Green River subbasin (Service 2015b).

The downlisting demographic criteria for Colorado pikeminnow in the Green River subbasin require that separate adult point estimates for the middle Green River and lower Green River do not show a statistically significant decline over a 5-year period, and each estimate for the Green River subbasin exceeds 2,600 adults (estimated minimum viable population [MVP] number) (Service 2002b). The average of the first two sets of adult estimates was 3,020 (between 2000 – 2008). The preliminary estimates for 2011-2013 are below 2,600 adults in each year.

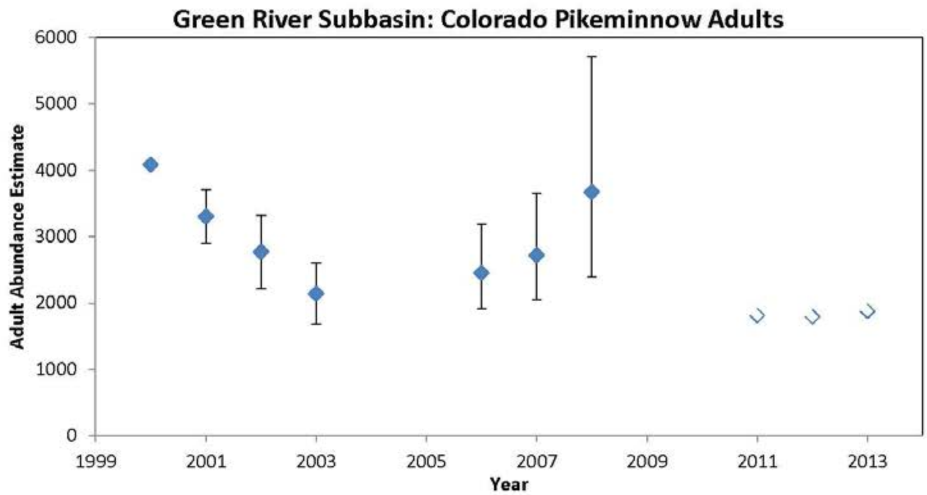

Figure 3. Adult Colorado pikeminnow population abundance estimates for the Green River (2000-2008 estimates from Bestgen et al. 2010; preliminary estimates for 2011-2013 from Bestgen et al. 2013). Error bars represent the 95 percent confidence intervals. In 2000, the lower Green River was not sampled. The data depicted for 2000 incorporates an extrapolated lower Green River contribution to the overall population estimate and therefore lacks a confidence interval.

Another demographic requirement in the 2002 Recovery Goals is that recruitment of naturally produced fish reaching the age of 6 must equal or exceed mean annual adult mortality. Estimates of recruitment age-6 fish have averaged 1,455 since 2001, but have varied widely (Figure 4). Recruitment has exceeded annual adult mortality in some years, but not others, which falls short of meeting the recruitment recovery goal for the Green River subbasin (Service 2011a; Service 2015b). However, this criterion is currently being revised to allow for a longer tracking period to accommodate natural fluctuations observed in the Green River population (Service 2011a).

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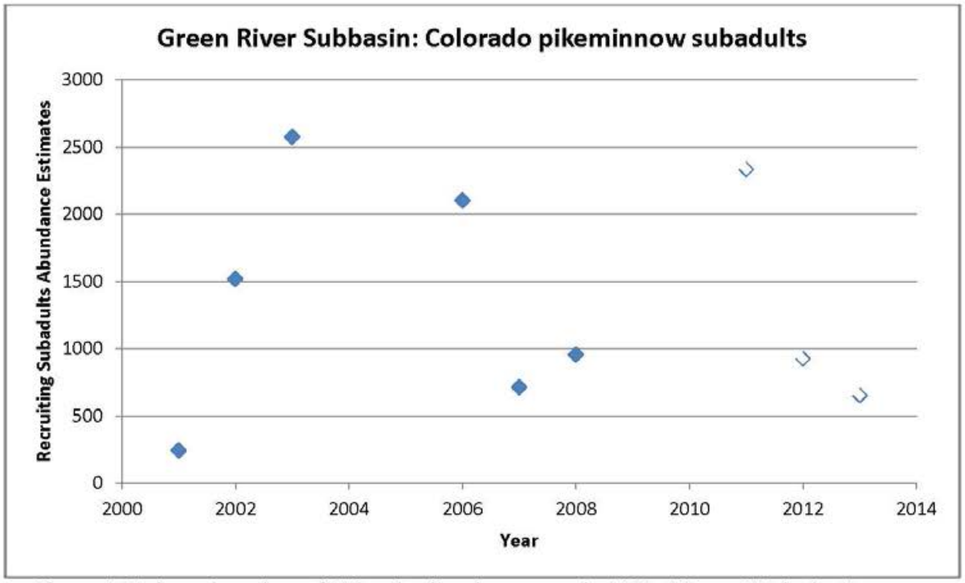

Figure 4. Estimated numbers of Colorado pikeminnow recruits (400–449 mm TL) in the Green River subbasin (Yampa, White, Middle Green, Desolation-Gray Canyons, and Lower Green) for 2001–2013. Data from Bestgen et al. (2010). Estimates of recruitment for the most recent 2011-2013 sampling period are preliminary.

Bestgen et al. (2010) recognized that the mechanism driving frequency and strength of recruitment events was likely the strength of age-0 Colorado pikeminnow production in backwater nursery habitats. Osmundson and White (2014) saw a similar relationship between a strong age-0 cohort in 1986 and subsequent recruitment of late juveniles five years later, but that relationship was more tenuous in later years. Researchers are particularly concerned with what appears to be very weak age-0 representation in the Middle Green reach (1999 thru 2008) and in the lower Colorado River (2001 thru 2008) (Figure 5). In some years, the Bureau of Reclamation has released higher summer base flows in the Green River based on the understanding that this may improve survival of young Colorado pikeminnow and disadvantage smallmouth bass.

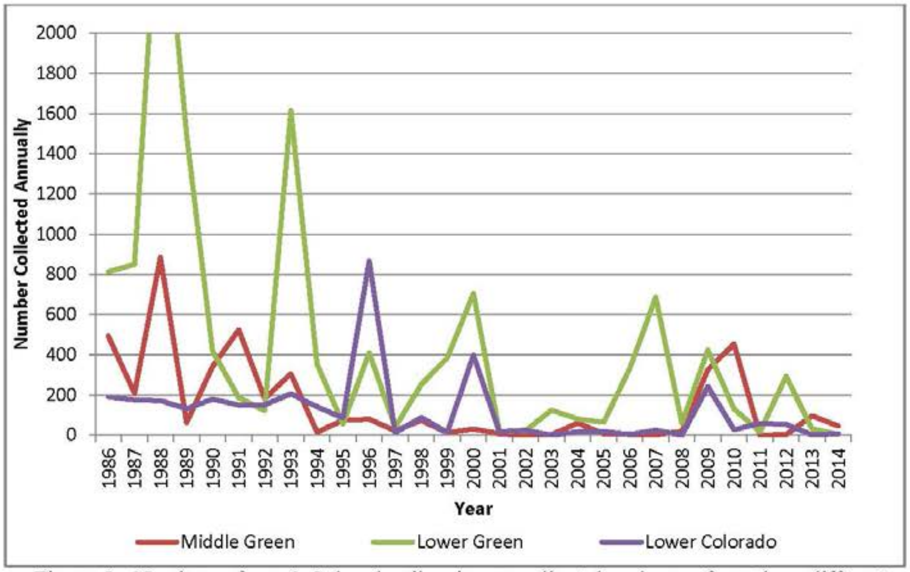

Figure 5. Numbers of age-0 Colorado pikeminnow collected each year from three different habitat reaches of river. A total of 2,892 Age-0 were collected in the lower Green River in 1988; the significance of strong Age-0 cohorts collected in the late 1980's was discussed in Bestgen et al. 2010. Data from Breen et al. 2014.

To summarize, in the Green River Subbasin, the Colorado pikeminnow subpopulation appears to have declined somewhat and the number of adults is below the level needed for recovery. Recruitment is quite variable over time, and has not exceeded adult mortality in all years when measured over the past two decades. The number of age-0 Colorado pikeminnow is also quite variable over time, but fewer have been captured, on average, since the year 2000 than prior to 2000 (Figure 5). Colorado pikeminnow are generally distributed throughout the Green River Subbasin now nearly to the same extent that they were when they became listed, although their numbers have dwindled in the Yampa River and the reach in the White River above the Taylor Draw Dam is no longer occupied (see Baseline section).

SAN JUAN RIVER

Unlike the Green and upper Colorado River Basins, wild Colorado pikeminnow are extremely rare in the San Juan River. Between 1991 and 1995, 19 (17 adult and 2 juvenile) wild Colorado pikeminnow were collected in the San Juan River by electrofishing between RM 142 (the former Cudei Diversion) and Four Corners at RM 119 (Ryden 2000; Ryden and Ahlm 1996). The multi-threaded channel, habitat complexity, and mixture of substrate types in this area of the river appear to provide a diversity of habitats favorable to Colorado pikeminnow on a year-round basis (Holden and Masslich 1997). Estimates made during the seven-year research period between 1991 and 1997 suggested that there were fewer than 50 adult Colorado pikeminnow in a given year (Ryden 2000).

Monitoring for adult Colorado pikeminnow currently occurs every year on the San Juan River. In 2013, 149 Colorado pikeminnow were collected during monitoring from RM 180-77, the eighth consecutive year that more than 100 Colorado pikeminnow were caught in this reach (Schleicher 2014). However, only 7 of these fish were greater than 450 mm (18 in). In addition, 19 Colorado pikeminnow greater than 450 mm (18 in) were collected during the non-native fish removal trips in 2013 (Duran et al. 2014). In order to downlist the species, the San Juan River population of Colorado pikeminnow must reach at least 1,000 Age-5 fish (Service 2002).

The majority of individuals come from hatchery reared stocks supported by the San Juan River Recovery Implementation Program. This program has stocked more than 2 million age 0 and age 1+ fish in the San Juan River since 2002 (Furr and Davis 2009). River wide population estimates for age-2+ pikeminnow that have been in the San Juan River at least one year was approximately 4,600 and 5,400 individuals in 2009 and 2010, respectively (Duran et al. 2010; 2013). However, because few adult Colorado pikeminnow were detected in the San Juan River, this population estimate largely consists of juveniles. Other Colorado pikeminnow abundance estimates exhibit substantial annual variation, likely due to the effects of short-term retention from recent stocking events, but no clear population trends were evident in the San Juan River Basin (Durst 2014).

Successful Colorado pikeminnow reproduction was documented in the San Juan River in 1993, 1995, 1996, 2001, 2004, 2007, 2009-2011, and 2013. A total of 58 larval Colorado pikeminnow were collected since 1993 (Farrington and Brandenburg 2014); however, there has been little to no recruitment documented in the San Juan River. A total of 48 Age-1+ Colorado pikeminnow were collected in 2013; all presumably the result of augmentation efforts (Farrington and Brandenburg 2014). Since 1998, Colorado pikeminnow were collected during small-bodied monitoring every year except 2001-2003; however, young of year (YOY) Colorado pikeminnow were stocked in each of these years prior to monitoring efforts so these fish were likely hatchery-reared (Service 2015c). Larval Colorado pikeminnow detections occurred throughout the San Juan River from Reach 4 (RM 106-130) downstream to Reach 1 (RM 0-16) (Farrington and Brandenburg 2014, Service 2015c). Franssen et al. (2007) found that maintenance of a natural flow regime favored native fish reproduction and provided prey at the appropriate time for Age-1 Colorado pikeminnow.

Tissue samples from Colorado pikeminnow caught during research conducted under the Recovery Program have been analyzed as part of a basin-wide analysis of endangered fish genetics. The results of that analysis indicate that the San Juan River fish exhibit less genetic variability than the Green River and Colorado River populations, likely due to the small population size, but they were very similar genetically to pikeminnow from the Green, Colorado, and Yampa rivers (Morizot in litt. 1996). These data suggest that the San Juan population is probably not a separate genetic stock (Holden and Masslich 1997; Houston et al. 2010).

To summarize, the Colorado pikeminnow was quite rare in the San Juan River in the 1990s, with an estimate of less than 50 adults. Since 2002, millions of young Colorado pikeminnow have been stocked into the river. Adult fish are still rather uncommon, however, and not nearly at the level yet needed for recovery. Despite low numbers of adults, reproduction is occurring to some extent, but recruitment is low. Most of the Colorado pikeminnow in the San Juan River are stocked juveniles. Through augmentation, Colorado pikeminnow are generally distributed throughout the San Juan River within critical habitat.

2.1.4 Threats

The Colorado pikeminnow was designated as an endangered species prior to enactment of the ESA, and therefore a formal listing package identifying threats was not assembled. Construction and operation of mainstem dams, nonnative fish species, and local eradication of native minnows and suckers in advance of new human-made reservoirs in the early 1960's were recognized as early threats (Service 2002a). According to the 2002 Recovery Goals for the species, the primary threats to Colorado pikeminnow populations are streamflow regulation and habitat modification (including cold-water dam releases, habitat loss, and blockage of migration corridors); competition with and predation by nonnative fish species; and pesticides and pollutants (Service 2002a).

In the Upper Basin, 435 miles of Colorado pikeminnow habitat has been lost by reservoir inundation from Flaming Forge Reservoir on the Green River, Lake Powell on the Colorado River, and Navajo Reservoir on the San Juan River. Cold water releases from these dams have eliminated suitable habitat for native fishes, including Colorado pikeminnow, from river reaches downstream for approximately 50 miles below Flaming Gorge Dam and Navajo Dam. In addition to main stem dams, many dams and water diversion structures occur in and upstream from critical habitat that reduce flows and alter flow patterns, which adversely affect critical habitat. Diversion structures in critical habitat can divert fish into canals and pipes where the fish become permanently lost to the river system. It is unknown how many endangered fish are lost in irrigation systems, but in some years, in some river reaches, the majority of the river flow is diverted into unscreened canals. Peak spring flows in the Green River at Jensen, Utah, have decreased 13–35 percent and base flows have increased 10–140 percent due to regulation by Flaming Gorge Dam (Muth et al. 2000).

Although a good portion of the recovery factor criteria (Service 2002a) are being addressed, nonnative fish species continue to be very problematic. Recovery Goals (Service 2002a, 2002b, 2002c, 2002d) identified predation or competition by nonnative fish species as a primary threat to the continued existence or the reestablishment of self-sustaining populations of Colorado pikeminnow and the other three endangered fishes (Martinez et al. 2014). Predation and competition from nonnative fishes have been clearly implicated in the population reductions or elimination of native fishes in the Colorado River Basin (Dill 1944, Osmundson and Kaeding 1989, Behnke 1980, Joseph et al. 1977, Lanigan and Berry 1979, Minckley and Deacon 1968, Meffe 1985, Propst and Bestgen 1991, Rinne 1991). Data collected by Osmundson and Kaeding (1991) indicated that during low water years nonnative minnows capable of preying on or competing with larval endangered fishes greatly increased in numbers. The Colorado River Basin is an altered riverscape and the interaction of native and nonnative species with non-adapted and competing life histories has contributed to what may be the largest expansion of nonnative fishes and displacement of native fishes in a North America river basin (Martinez et al. 2014). More than 50 nonnative fish species were intentionally introduced in the Colorado River Basin prior to 1980 for sportfishing, forage fish, biological control and ornamental purposes

(Minckley 1982, Tyus et al. 1982, Carlson and Muth 1989). The numerous nonnative species have begun to overshadow the 14 native fish species in the basin.

Nonnative fishes compete with native fishes in several ways and include predation, habitat degradation, competition for resources, hybridization or disease transmission (Martinez et al. 2014). The capacity of a particular area to support aquatic life is limited by physical habitat conditions and increasing the number of species in an area usually results in smaller populations of most species. The size of each species population is controlled by the ability of each life stage to compete for space and food resources and to avoid predation. Some life stages of nonnative fishes appear to have a greater ability to compete for space and food and to avoid predation in the existing altered habitat than do some life stages of native fishes. Tyus and Saunders (1996) cite numerous examples of both indirect and direct evidence of predation on eggs and larvae by nonnative species.

The Service has begun discussions about the potential downlisting of Colorado pikeminnow, but the biggest obstacle may become the existing and future threat of invasive ecological impacts by nonnative aquatic species, particularly predatory sport fishes. The most problematic nonnative fish species in the basin have been identified as northern pike, smallmouth bass and channel catfish *Ictalurus punctatus*, although other nonnative percid, ictalurid, cyprinid, centrarchid and catastomid species continue to be problematic as well (Martinez et al. 2014). Arguably the biggest efforts of the Recovery Program today center on the control of nonnatives species.

Threats from pesticides and pollutants include accidental spills of petroleum products and hazardous materials; discharge of pollutants from uranium mill tailings; and high selenium concentration in the water and food chain (Service 2002a). Accidental spills of hazardous material into occupied habitat can cause immediate mortality when lethal toxicity levels are exceeded. Researchers now speculate that mercury may pose a more significant threat to Colorado pikeminnow populations of the upper Colorado River basin than previously recognized (Service 2015b). Osmundson and Lusk (2012) have recently reported elevated mercury concentrations in Colorado pikeminnow muscle tissue; the highest concentrations were from the largest adults collected from the Green and Colorado River sub-basins.

To summarize, Colorado pikeminnow habitat loss and degradation from dams and diversions constructed decades ago generated some of the early, primary impacts to the species. Most of the long-term impacts from these structures continue and are unlikely to change significantly in the near term. In the remaining suitable habitats, nonnative fish species pose a significant ongoing threat and challenge to recovery. Contaminants, including mercury and selenium, pose a threat as well, but the magnitude of this threat is in need of further investigation.

2.2 Razorback Sucker

2.2.1 Species description

Like all suckers (family Catostomidae meaning "down mouth"), the razorback sucker has a ventral mouth. It is a robust, river catostomid endemic to the Colorado River Basin (Sigler and Sigler 1996; Service 2002b) and is the largest native sucker to the western United States. The species feeds primarily on algae, aquatic insects, and other available aquatic macroinvertebrates using their ventral mouths and fleshy lips (Sigler and Sigler 1996). Adults can be identified by olive to dark brown coloration above, with pink to reddish brown sides and a bony, sharp-edged dorsal keel immediately posterior to the head, which is not present in the young. The species can reach lengths of 3 ft and weights of 16 pounds (7.3 kg), but the maximum weight of recently captured fish is 11 to 13 pounds (5 to 6 kg) (Sigler and Sigler 1996; Service 2002b). Taxonomically, the species is unique, belonging to the monotypic genus *Xyrauchen*, meaning that razorback sucker is the only species in the genus (Service 2002b). Like Colorado pikeminnow, razorback suckers may live to be greater than 40 years.

Historically, the razorback sucker occupied the mainstem Colorado River and many of its tributaries from northern Mexico through Arizona and Utah into Wyoming, Colorado, and New Mexico (Service 2002b). In the late 19th and early 20th centuries, it was abundant in the Lower Colorado River Basin and common in parts of the Upper Colorado River Basin, with numbers apparently declining with distance upstream (Service 2002b). Bestgen (1990) reported that this species was once so numerous that it was commonly used as food by early settlers and that a commercially marketable quantity was caught in Arizona as recently as 1949. Distribution and abundance of razorback sucker declined throughout the 20th century across its historic range, and the species now exists naturally only in a few small, unconnected populations or as dispersed individuals. Specifically, razorback sucker are currently found in small numbers in the Green River, upper Colorado River, and San Juan River sub-basins; the lower Colorado River between Lake Havasu and Davis Dam; Lakes Mead and Mohave; in small tributaries of the Gila River sub-basin (Verde River, Salt River, and Fossil Creek); and in local areas under intensive management such as Cibola High Levee Pond, Achii Hanyo Native Fish Facility, and Parker Strip (Service 2002b).

The razorback sucker is listed as endangered under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et. seq.), under a final rule published on October 23, 1991 (56 FR 54957). The Service finalized the latest recovery plan for the species in 2002 (2002b), but is currently drafting an updated revision.

Fifteen reaches of the Colorado River system were designated as critical habitat for the razorback sucker totaling 2,776 km (1,724 mi) as measured along the center line of the river within the subject reaches. Designated critical habitat makes up about 49 percent of the species' original range and occurs in both the Upper and Lower Colorado River Basins. In the Upper Basin, critical habitat is designated for portions of the Green, Yampa, Duchesne, Colorado, White, Gunnison, and San Juan Rivers. Portions of the Colorado, Gila, Salt, and Verde Rivers are designated in the Lower Basin.

Separate, objective recovery criteria were developed for each of two recovery units (the Upper Colorado and Lower Colorado River Basins as delineated at Glen Canyon Dam) to address unique threats and site specific management actions necessary to minimize or remove those threats. This BOs focus is on the Upper Colorado River Basin recovery unit and will therefore describe the status of the razorback sucker in that unit.

2.2.2 Life history

Except during periods before and after spawning, adult razorback sucker are thought to be relatively sedentary and have high fidelity to overwintering sites (Service 2002b). Adults become sexually mature at approximately 4 years and lengths of 400 mm (16 in.) (Zelasko et al. 2009), at which time they travel long distances to reach spawning sites (Service 2002b). Mature adults breed in spring (mostly April–June) on the ascending limb of the hydrograph, congregating over cobble/gravel bars, backwaters, and impounded tributary mouths near spawning sites (Service 2002b; Snyder and Muth 2004; Zelasko et al. 2009). Flow and water temperature cues may play an important role prompting razorback adults to aggregate prior to spawning (Muth et al. 2000). Tyus and Karp (1990) and Osmundson and Kaeding (1991) reported off-channel habitats to be much warmer than the mainstem river and that razorback suckers presumably moved to these areas for feeding, resting, sexual maturation, spawning, and other activities associated with their reproductive cycle.

Razorback sucker have high reproductive potential, with reported average female fecundity of approximately 50,000 to 100,000 eggs per fish (Service 2002b). They are broadcast spawners that scatter adhesive eggs over gravel-cobble substrate (Snyder and Muth 2004). High springs flows are important to egg survival because they remove fine sediment that can otherwise suffocate eggs. Hatching is limited at temperatures less than 10°C (50° F) and best around 20°C (68° F) (Snyder and Muth 2004). Eggs hatch 6 to 11 days after being deposited and larval fish occupy the sediment for another 4 to 10 days before emerging into the water column. Larval fish occupy shallow, warm, low-velocity habitats in littoral zones, backwaters, and inundated floodplains and tributary mouths downstream of spawning bars for several weeks before dispersing to deeper water (Service 2002b; Snyder and Muth 2004). It is believed that low survival in early life stages, attributed to loss of nursery habitat and predation by non-native fishes, causes extremely low recruitment in wild populations (Muth et al. 2000). Wydoski and Wick (1998) identified starvation of larval razorback suckers due to low zooplankton densities in the main channel and loss of floodplain habitats which provide adequate zooplankton densities for larval food as one of the most important factors limiting recruitment.

Razorback sucker in the Upper Basin tend to be smaller and grow slower than those in the Lower Basin, reaching 100 millimeters (4 in.) on average in the first year (Service 2002b). Based on collections in the middle Green River, typical adult size centers around 510 mm (20 in.) (Modde et al. 1996). Razorback suckers are long-lived fishes, reaching 40+ years via high annual survival (Service 2002b). Adult survivorship was estimated to be 71 to 73 percent in the Middle Green River from 1980-1992 (Modde et al. 1996; Bestgen et al. 2002) and 76 percent from 1990 to 1999 (Bestgen et al. 2002).

Outside of the spawning season, adult razorback suckers occupy a variety of shoreline and main channel habitats including slow runs, shallow to deep pools, backwaters, eddies, and other relatively slow velocity areas associated with sand substrates (Tyus and Karp 1989, Osmundson and Kaeding 1989, Osmundson and Kaeding 1991, Tyus and Karp 1990). Their diet consists primarily of algae, plant debris, and aquatic insect larvae (Sublette et al. 1990).

2.2.3 Population dynamics

Population estimates during the 1980 to 1992 period were on average between 300 and 600 wild fish (Modde et al. 1996). By the early 2000s, the wild population consisted of primarily aging adults, with steep decline in numbers caused by extremely low natural recruitment (Service 2002b). Although reproduction was occurring, very few juveniles were found (Service 2002b).

In the early part of the 2000s, population numbers were extremely low. Population estimates from sampling efforts in the Middle Green River had declined to approximately 100 by 2002, with researchers hypothesizing that wild fish in the Green River Basin could become extirpated because of lack of recruitment (Bestgen et al. 2002). Similarly, in the upper Colorado River, razorback sucker were exceedingly rare. In the 2002 recovery plan, razorback sucker were considered extirpated in the Gunnison River, where fish were last captured in 1976 (Service 2002b). Similarly, in the Grand Valley, only 12 fish were collected from 1984 to 1990, despite intensive sampling (Service 2002b). No young razorback sucker were captured in the Upper Colorado River since the mid-1960s (Service 2002b).

Razorback sucker likely occurred in the San Juan River as far upstream as Rosa, New Mexico (now inundated by Navajo Reservoir) (Ryden 1997). In the San Juan River we know of only two wild razorback suckers that were captured in 1976 in a riverside pond near Bluff, Utah, and one fish captured in the river in 1988, also near Bluff (Ryden 2006). No wild razorback sucker were found during the 7-year research period (1991–1997) of the San Juan River Basin Recovery Implementation Program (Ryden 2006).

Because of the low numbers of wild fish, the Recovery Program has been rebuilding razorback sucker populations in the upper Colorado River Basin with hatchery stocks. Since 1995, over 375,000 subadult razorback suckers have been stocked in the Green and upper Colorado River subbasins. Preliminary population estimates were generated for razorback sucker in the Colorado River as a whole (from Palisade, CO downstream to its confluence with the Green River), for adult fish > 400 mm TL (Figure 6). Although razorback sucker numbers have begun increasing in the past decade in the Green River subbasin due to stocking efforts, no standardized monitoring program to produce a population estimate has begun for the Green River subbasin (Service 2012a).

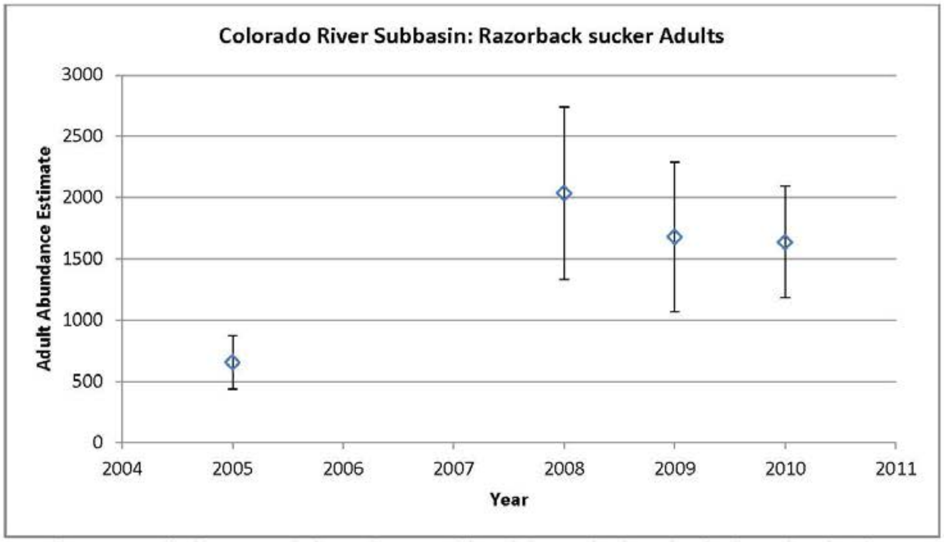

Figure 6. Preliminary population estimates of the adult razorback sucker in the Colorado River (Palisade, CO to the confluence of the Green River). Error bars represent the 95 percent confidence intervals (Service 2015b).

Razorback sucker stocked in the Green and Colorado Rivers have been recaptured in reproductive condition and often in spawning groups. Larval captures in the Green, Gunnison, and Colorado rivers document reproduction. Survival of larvae through their first year remains rare, largely due to a decrease in the availability of warm, food-rich floodplain areas and predation by a suite of nonnatives when the flood plain nursery habitats are available (Bestgen et al. 2011). However, occasional captures of juveniles (just over age-1) in the Green and Colorado rivers suggest that survival of early life stages is occurring. Collections of larvae by light trap in the middle Green River have been generally increasing since 2003; in 2013, the largest collection of light trapped larvae occurred (7,376; Figure 7, Service 2015b).

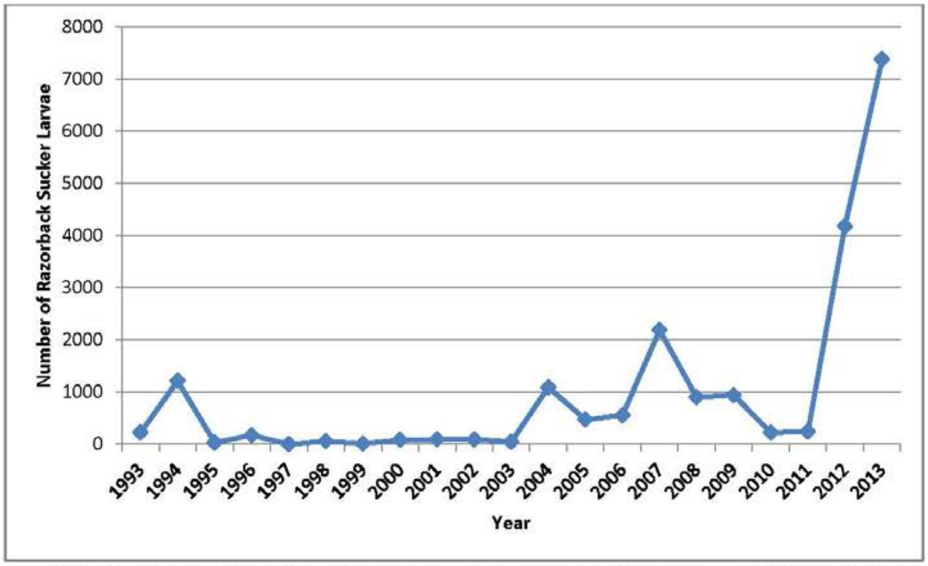

Figure 7. Numbers of razorback sucker larvae collected in light traps in the middle Green River since 1993.

In the San Juan River, 130,473 razorback suckers were stocked from 1994 through 2012. The number of endangered fishes stocked in the San Juan River is reported annually (see http://www.fws.gov/southwest/sjrip/). After stocking in the San Juan River began, river wide razorback sucker population estimates of 268 in October 2000 (Ryden 2001) have since grown to 1,200 in October 2004 (Ryden 2005), and to about 2,000 and 3,000 in 2009 and 2010, respectively (Duran et al. 2013). Additional mark-recapture data indicates increasing razorback sucker abundance estimates since 2009 (Durst 2014). However, because there is little to no documented recruitment in the San Juan River, this population increase should be attributed almost entirely to augmentation with hatchery-reared razorback suckers.

Three razorback sucker stocked in the San Juan River near Farmington, NM, for the San Juan Recovery Program were captured between Moab, UT and the state line with Colorado in 2008. This demonstrates that exchange of stocked razorback sucker between the San Juan River and the Upper Colorado River is certain, and may have ramifications for recovery criteria. Researchers have confirmed that hundreds of razorback sucker are using both transitional inflow areas and fully lacustrine (lake-like) habitats in Lake Powell. Razorback sucker are spawning in the lake and there is now evidence that recruitment may be occurring (Service 2015b). While the role of Lake Powell in the recovery of razorback sucker is unclear, 75 individuals were detected in the San Juan arm of Lake Powell in 2011 (Francis et al. 2013).

To summarize, the razorback sucker was facing extirpation in the Upper Colorado River basin approximately 20 years ago. To build population numbers in the Green, Colorado, and San Juan River subbasins, over a quarter of a million razorbacks have been stocked in these rivers. Stocking continues today and reproduction is occurring and increasing. Recruitment has also been documented recently, but appears to be the most limiting factor for re-establishing a self-sustaining population in the wild.

2.2.4 Threats

According to the 2002 Recovery Goals for the species, the primary threats to razorback sucker populations are streamflow regulation and habitat modification (including cold-water dam releases, habitat loss, and blockage of migration corridors); competition with and predation by nonnative fish species; and pesticides and pollutants (Service 2002b). No new threats have emerged since the completion of this document. The Service's status review of razorback sucker completed in 2012 (Service 2012b) reported that 85 percent of the downlisting recovery factor criteria (Service 2002b) have been addressed to varying degrees; however, nonnative fish species continue to be problematic.

Many researchers believe that nonnative species are a major cause for the lack of recruitment and that nonnative fish are the most important biological threat to the razorback sucker (e.g., McAda and Wydoski 1980, Minckley 1983, 59 FR 54957, Service 2002b, Muth et al. 2000). There are reports of predation of razorback sucker eggs and larvae by common carp, channel catfish, smallmouth bass, largemouth bass, bluegill, green sunfish, and red-ear sunfish (Marsh and Langhorst 1988, Langhorst 1989).

Marsh and Langhorst (1988) found higher growth rates in larval razorback sucker in the absence of predators in Lake Mohave, and Marsh and Brooks (1989) reported that channel catfish and flathead catfish were major predators of stocked razorback sucker in the Gila River. Juvenile razorback sucker (average total length [TL] 171 mm [6.7 in.]) stocked in isolated coves along the Colorado River in California, suffered extensive predation by channel catfish and largemouth bass (Langhorst 1989).

Carpenter and Mueller (2008) tested nine non-native species of fish that co-occur with razorback sucker and found that seven species consumed significant numbers of larval razorback suckers. The seven species consumed an average of 54 – 99 percent of the razorback sucker larvae even though alternative food was available (Carpenter and Mueller 2008). Lentsch et al. (1996) identified six species of nonnative fishes in the upper Colorado River Basin as threats to razorback sucker: red shiner, common carp, sand shiner, fathead minnow, channel catfish, and green sunfish. Smaller fish, such as adult red shiner, are known predators of larval native fish (Ruppert et al. 1993). Large predators, such as walleye, northern pike (*Esox lucius*), and striped bass, also pose a threat to subadult and adult razorback sucker (Tyus and Beard 1990). Until recently, efforts to introduce young razorback sucker into Lake Mohave have failed because of predation by nonnative species (Minckley et al. 1991, Clarkson et al. 1993, Burke 1994, Marsh et al. 2003).

Overall, the threats to the razorback sucker from nonnative fish are similar to those facing the Colorado pikeminnow, as described above. See the discussion on threats to the Colorado pikeminnow above for further information, particularly regarding the threat to all endangered fish due to predation from nonnative species. One threat from nonnative species peculiar to the razorback sucker is from hybridization. While hybridization between native and endangered razorback sucker may occur in the wild at a low level (Buth et al. 1987), the mass release of any native suckers hybridized with nonnative suckers would threaten gene pools of wild native or endangered suckers. McDonald et al. (2008) revealed that hybridization of native bluehead (*Catostomus discobolus*) and flannelmouth (*Catostomus latipinnis*) suckers with the nonnative white sucker (*Catostomus commersonii*) increased introgression between the native suckers. This mechanism could ultimately pose an increased threat of hybridization for razorback sucker (USFWS 2002b).

Selenium, a trace element, is a natural component of coal and soils in many areas of the western United States 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 (Mayer et al. 2010). Selenium can enter surface waters through erosion, leaching, and runoff. 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 (Lemly 2002, Hamilton et al. 2004; Holm et al 2005). Excess dietary selenium causes elevated selenium concentrations to be deposited into developing eggs, particularly the yolk (Buhl and Hamilton 2000, Lemly 2002, Janz 2010). If concentrations in the egg are sufficiently high, developing proteins and enzymes become dysfunctional, leading to embryo deformation and a higher risk of mortality. Embryos that do survive, hatch, and grow may experience an elevated risk of predation as small fish. Of all the endangered fish in the Colorado River system, concern regarding elevated selenium levels is greatest for the razorback sucker (Hamilton et al. 2002; Osmundson et al. 2010).

Hamilton (1999) hypothesized that historic selenium contamination of the upper and lower Colorado River basins contributed to the decline of these endangered fish by affecting their overall reproductive success, including loss of eggs and larvae. Selenium concentrations in whole-body fish in the Colorado River Basin have been among the highest in the nation (Hamilton 1999). Several Department of the Interior National Irrigation Water Quality Program (NIWQP) studies in the Colorado River Basin have reported elevated levels of selenium in water, sediment, and biota, including fish (Hamilton 1999). In the NIWQP studies of 25 areas in the 15 western states, the middle Green River ranked 3rd for the highest median water concentration of selenium, 1st for sediment, and 1st for fish, and 14th for birds. The Gunnison River Basin/Grand Valley ranked 4th for the highest median water concentration of selenium, 2nd for sediment, 7th for fish, and 1st for birds (Engberg, 1998, as seen in Hamilton 1999). Unlike the Green, Gunnison, and Colorado Rivers, high selenium levels have not been reported in the Yampa and White Rivers (see section 3.3 Contaminants in the Action Area below for further discussion). While selenium has been more the focus of contaminants research involving the razorback sucker, mercury, which can pose a threat to any animal species, could also pose a threat at elevated concentrations. Because the razorback sucker is not a top predator, as is the Colorado pikeminnow, we expect mercury bioaccumulation (through prey) to pose less of a problem for this species.

To summarize, razorback sucker habitat loss and degradation from dams and diversions constructed decades ago posed some of the early, primary impacts to the species. Most of the long-term impacts from these structures continue and are unlikely to change significantly in the near term. In the remaining suitable habitats, nonnative fish species pose a significant ongoing threat and challenge to recovery. Contaminants, including mercury and selenium, pose a threat as well, but the magnitude of this threat is in need of further investigation.

2.3 Humpback Chub

2.3.1 Species description

The humpback chub is a medium-sized freshwater fish of the minnow family endemic to the Colorado River basin. The species evolved around 3 to 5 million years ago (Sigler and Sigler 1996). The pronounced hump behind its head gives the humpback chub a striking, unusual appearance. It has an olive-colored back, silver sides, a white belly, small eyes, and a long snout that overhangs its jaw (Sigler and Sigler 1996). This fish can grow to nearly 500 mm (20 in.) and may survive more than 30 years in the wild (Service 2002c). The humpback chub does not have the swimming speed or strength of species such as the Colorado pikeminnow. Instead, it uses its large fins to "glide" through slow-moving areas, feeding on insects.

Historic distribution is surmised from various reports and collections that indicate the species inhabited canyons of the Colorado River and four of its tributaries: the Green, Yampa, White, and Little Colorado Rivers. Presently the species occupies about 68 percent of its historic habitat. Historic to current abundance trends are unclear because historic abundance is unknown (Service 2002c).

The Office of Endangered Species first included the humpback chub in the List of Endangered Species on March 11, 1967 (32 FR 4001). Subsequently, it was considered endangered under provisions of the Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa) and was included in the United States List of Endangered Native Fish and Wildlife issued on June 4, 1973 (38 FR No. 106). It is currently protected under the Endangered Species Act of 1973 as an endangered species throughout its range (ESA; 16 U.S.C. 1531 *et. seq.*). The Service finalized the latest recovery plan for the species in 2002 (Service 2002c), but is currently drafting an updated revision.

Separate, objective recovery criteria were developed for each of two recovery units (the Upper Colorado and Lower Colorado River Basins as delineated at Glen Canyon Dam) to address unique threats and site-specific management actions necessary to minimize or remove those threats. This biological opinion's focus is on the Upper Colorado River Basin recovery unit and will therefore describe the status of the humpback chub in that unit.

2.3.2 Life History

Like other large desert river fishes, the humpback chub is an obligate warm-water species that requires relatively warm temperatures for spawning, egg incubation, and survival of larvae. Unlike Colorado pikeminnow and razorback sucker, which are known to make extended migrations of up to several hundred miles to spawning areas, humpback chubs do not appear to make extensive migrations. Instead, humpback chub live and complete their entire life cycle in canyon-bound reaches of the Colorado River mainstem and larger tributaries characterized by deep water, swift currents, and rocky substrates (Service 2002c). Individuals show high fidelity for canyon reaches and move very little.

Mature humpback chub typically spawn on the descending hydrograph between March and July in the Upper Basin (Karp and Tyus 1990). Humpback chub are broadcast spawners who may mature as young as 2 to 3 years old. Eggs incubate for three days before swimming up as larval fish (Service 2002c). Egg and larvae survival are highest at temperatures close to 19 to 22°C (Service 2002c). Unlike larvae of other Colorado River fishes (e.g., Colorado pikeminnow and razorback sucker), larval humpback chub show no evidence of long-distance drift (Robinson et al.1998).

Recruitment appears to be successful in all known Upper Basin populations (Service 2002c). Survival of humpback chub during the first year of life is low, but increases through the first 2 to 3 years of life with decreased susceptibility to predation, starvation, and environmental changes. Survival from larvae to adult life stages was estimated at 0.1 percent (0.001) (Service 2002c). Survival of adults is high, with estimates approximating 75 percent based on Grand Canyon adults (Service 2002c).

Growth rates of humpback chub vary by populations, with fish in the Upper Basin growing slower than those in the Grand Canyon (Service 2002c). Individuals in Cataract Canyon were 50, 100, 144, 200, 251, and 355 mm total length from 1 to 6 years, respectively (Service 2002c). Based on sexual maturity and age-to-length ratios, adults are classified as those fish 200 mm or longer. Maximum life span is estimated to be 30 years in the wild.

Humpback chub move substantially less than other native Colorado River fishes, with studies consistently showing high fidelity by humpback chub for specific riverine locales occupied by respective populations. Despite remarkable fidelity for given river regions, individual humpback chub adults are known to move between populations. Movement by juveniles is not as well documented as for adults, but is also believed to be limited in distance. For example, no out-migration by young fish is seen from population centers such as Black Rocks and Westwater Canyon.

2.3.3 Population dynamics

Currently, five wild humpback chub populations occur upstream of Glen Canyon Dam and two downstream. In the Upper Colorado River Basin the two most stable populations are found near the Colorado/Utah border: one at Westwater Canyon in Utah; and one in an area called Black Rocks, in Colorado (Upper Colorado River Endangered Fish Recovery Program and San Juan River Basin Recovery Implementation Program 2010). Smaller numbers in the Upper Basin were found in the Yampa and Green Rivers in Dinosaur National Monument, Desolation and Gray Canyons on the Green River in Utah, and Cataract Canyon on the Colorado River in Utah (Service 2002c). The two populations in the Lower Colorado River Basin occur in the mainstem Colorado and Little Colorado Rivers. The Little Colorado River population, found in the Grand Canyon, is the largest known population, harboring up to 10,000 fish (Service 2002c).

Recovery goal downlisting demographic criteria (USFWS 2002c) for humpback chub require each of five populations in the upper Colorado River basin to be self-sustaining over a 5-year period, with a trend in adult point estimates that does not decline significantly. Secondarily, recruitment of age-3 (150–199 mm TL) naturally produced fish must equal or exceed mean adult annual mortality. In addition, one of the five populations (e.g., Black Rocks/Westwater Canyon or Desolation/Gray Canyons) must be maintained as a core population such that each estimate exceeds 2,100 adults (estimated minimum viable population number).

Population estimates for four of the five upper basin population are shown in Figure 8. No population estimate is available for the Yampa/Green River population in Dinosaur National Monument (see Baseline section for further details). The Desolation/Gray Canyons population of wild adults was estimated at 1,300 in 2001, 2,200 in 2002, and 940 in 2003 (Jackson and Hudson 2005). Sampling in 2001 and 2002 was conducted in summer, whereas beginning in 2003, sampling was shifted to fall to avoid capturing Colorado pikeminnow that use Desolation Canyon for spawning. In a report on 2006–2007 estimates, researchers (Badame 2012) indicated that this population was trending downward. Badame (2012) linked declining catch of humpback chub in the upper portions of Desolation Canyon in the 2006–2007 estimates with increasing densities of nonnative smallmouth bass. Utah Division of Wildlife Resources (UDWR) researchers recommended securing a representative sample of adults in captivity. In 2009, 25 adults were taken to Ouray National Fish Hatchery. In 2011, six sites throughout Desolation Canyon were monitored for adults, 55 individual adults were encountered, but recaptures were too few to calculate a population estimate.

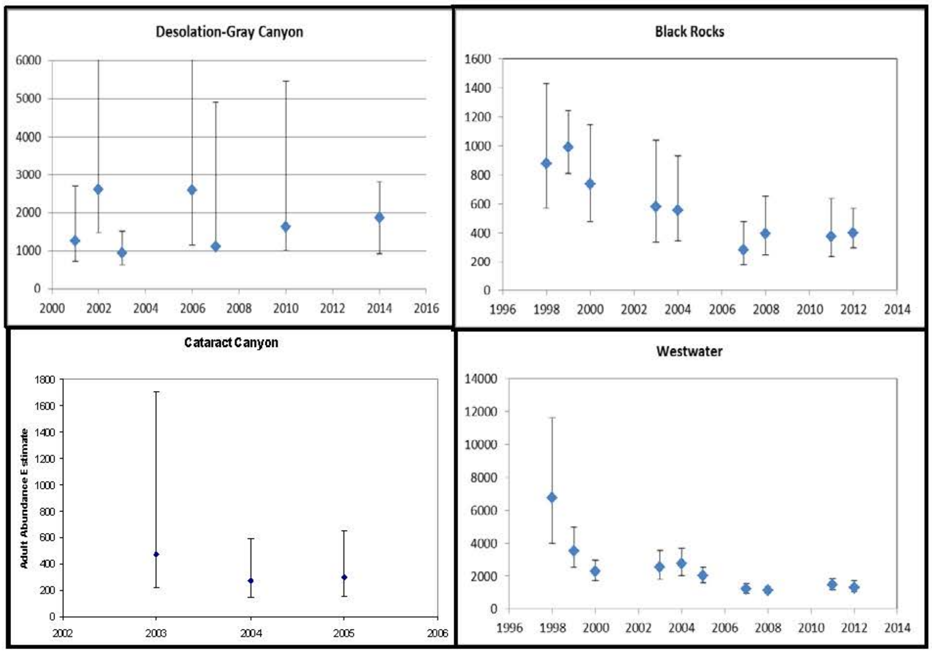

Figure 8. Adult humpback chub population estimates with confidence intervals for four populations in the upper Colorado River Basin (note that the scale differs among the graphs for the different populations). Clockwise from upper left: Desolation-Gray Canyons (from Badame 2011, 2012; Service 2015b); Black Rocks (from Francis and McAda 2011); Westwater Canyon (from Elverud 2011); and Cataract Canyon (from Badame 2008).

On the Colorado River of the upper Colorado River basin, three humpback chub populations are recognized. Black Rocks and Westwater Canyon have enough exchange of individuals that they are considered a single core population. In Black Rocks, estimates of wild adults have varied from about 800 in 1998, 900 in 1999, and 500 in 2000 and 2003 (Figure 8) (McAda 2007). The most recent estimates, in 2007–2008 were 345 and 287, respectively. During the fall of 2011 and 2012, 78 and 112 individual adult humpback chub were caught respectively - similar to the numbers caught in 2007 and 2008 (61 and 74, respectively). Population estimates for Black Rocks for 2011 and 2012 were 379 and 403, respectively. Researchers caution that 78 largemouth bass and the same number of gizzard shad were collected in Black Rocks in 2012. This represents a ten-fold increase over the 2011 catch. The Westwater Canyon estimates of wild adults range from about 4,700 in 1998 to 2,500 in 1999, 2000, and 2003 (Jackson and Hudson 2005). The 2007–2008 estimates were about 1,750 and 1,300. The large declines in humpback chub densities in both Black Rocks and Westwater Canyons occurred in the late 1990's and are not attributed to more recent increases of nonnative predators in the Colorado River.

In 2008, the core population (Black Rocks / Westwater combined) dropped below the population size downlist criterion (MVP = 2,100 adults) for the first time. In 2011, we saw some recovery in those populations where the estimate for adults in Westwater Canyon alone was 1,467;

however, UDWR reported 1,315 adults in 2012. The core population estimates in 2011 and 2012 were 1846 and 1718, respectively (Figure 9). Population estimates in both Black Rocks and Westwater canyons declined dramatically during the first population estimation rotation in the late 1990s, but have remained relatively stable since that time. Colorado State University's recent robust population estimate analysis more clearly indicated that declines in the Westwater and Black Rock humpback chub populations are due to lapses in recruitment (i.e. adult survival rates have remained stable). Principle investigators agree that reinitiating an age-0 monitoring component is advisable. It should be noted that whatever is affecting humpback chub recruitment has not affected sympatric populations of native roundtail chub; roundtail chubs populations in both canyons have remained stable or have increased since population estimation started. In addition to the potential and recent negative interactions between humpback chub and nonnative predators discussed above, both the Westwater and Black Rocks populations are at risk of potential chemical contamination due to the proximity of a railroad located on the right bank of the Colorado River which at times transports toxic substances.

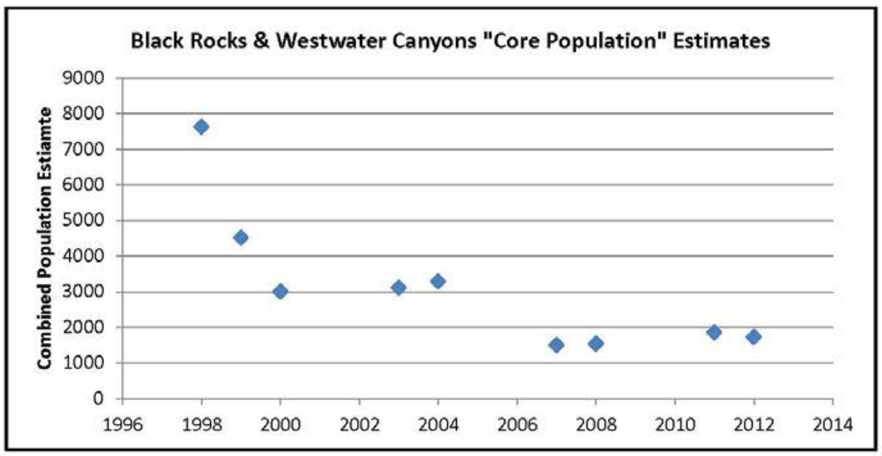

Figure 9. Combined population estimates for humpback chub in Black Rocks and Westwater Canyon based on a robust open model created by Dr.'s Bestgen and White, Colorado State University. The 2002 Recovery Goal downlist criteria for these combined ("core population") estimates is 2,100 adults.

The Cataract Canyon humpback chub population is small, with estimates of about 150 wild adults in 2003 and 66 in 2005 (Badame 2008). Estimates are difficult to obtain in Cataract; therefore, catch-per-unit-effort (CPUE) has been determined to be an effective replacement (began in 2008 on a 2-years-on, 2-years-off sampling regime). In 2011, UDWR reported that the Cataract population appears to be stable with CPUE ranging between 0.010 and 0.035 fish/net-hour. Despite additional effort to sample below Big Drop Rapid, no additional humpback chub were encountered in the new riverine habitat created by low Lake Powell levels.

2.3.4 Threats

The humpback chub was designated as an endangered species prior to enactment of the ESA, and therefore a formal listing package identifying threats was not assembled. Construction and operation of mainstem dams, nonnative fish species, and local eradication of native minnows and suckers in advance of new human-made reservoirs in the early 1960's were recognized as early threats (Service 2002c). According to the 2002 Recovery Goals for the species, the primary threats to humpback chub are streamflow regulation, habitat modification, predation by non-native fish species, parasitism, hybridization with other native *Gila* species, and pesticides and pollutants (Service 2002c). No new threats have emerged since the completion of this document. The Service's status review of humpback chub completed in 2011 (Service 2011b) reported that 60 percent of the recovery factor criteria (Service 2002c) have been addressed to varying degrees; however, nonnative fish species and issues dealing with the potential chemical contamination of the river from spills and pipelines continue to be problematic. Overall, the threats to the humpback chub from nonnative fish are similar to those facing the Colorado pikeminnow, as described above. See the discussion on threats to the Colorado pikeminnow above for further information, particularly regarding the threat to all endangered fish due to predation from nonnative species.

To summarize, humpback chub habitat loss and degradation from dams and diversions constructed decades ago posed some of the early, primary impacts to the species. Most of the long-term impacts from these structures continue and are unlikely to change significantly in the near term. In the remaining suitable habitats, nonnative fish species pose a significant ongoing threat and challenge to recovery. Contaminants, including mercury and selenium, may pose a lesser threat as well, but the magnitude of this threat is in need of further investigation.

2.4 Bonytail

2.4.1 Species description

The bonytail is a medium-sized freshwater fish in the minnow family, endemic to the Colorado River Basin. The species evolved around 3 to 5 million years ago (Sigler and Sigler 1996). Individuals have large fins and a streamlined body that typically is very thin in front of the tail. They have a gray or olive colored back, silver sides, and a white belly (Sigler and Sigler 1996). The mouth is slightly overhung by the snout and there is a smooth low hump behind the head that is not as pronounced as the hump on a humpback chub. A very close relative to the roundtail chub (*Gila robusta*), bonytail can be distinguished by counting the number of rays in the fins, with bonytail having 10 dorsal and anal fin rays (Sigler and Sigler 1996). The fish can grow to be 600 mm (24 in.) and are thought to live as long as 20 to 50 years (Sigler and Sigler 1996). Little is known about the specific food and habitat of the bonytail because the species was extirpated from most of its historic range prior to extensive fishery surveys, but it is considered adapted to mainstem rivers, residing in pools and eddies, while eating terrestrial and aquatic insects (Service 2002d).

Bonytail were once widespread in the large rivers of the Colorado River Basin (Service 2002a). The species experienced a dramatic, but poorly documented, decline starting in about 1950, following construction of mainstem dams, introduction of nonnative fishes, poor land-use practices, and degraded water quality Service 2002d). Population trajectory over the past century and reasons for decline are unclear because lack of basin-wide fishery investigations precluded accurate distribution and abundance records.

Bonytail are now rarely found in the Green and Upper Colorado River sub-basins and are the rarest of all the endangered fish species in the Colorado River Basin. In fact, no wild, self-sustaining populations are known to exist upstream of Lake Powell. In the last decade only a handful of bonytail were captured on the Yampa River in Dinosaur National Monument, on the Green River at Desolation and Gray canyons, and on the Colorado River at the Colorado/Utah border and in Cataract Canyon. In the lower basin, bonytail exist in Lake Mohave and Lake Havasu.

The bonytail is currently listed as endangered under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et. seq.*), under a final rule published on April 23, 1980 (45 FR 27710). The Service finalized the latest recovery plan for the species in 2002 (U.S. Fish and Wildlife Service 2002d), but is currently drafting an updated revision.

The Service designated seven reaches of the Colorado River as critical habitat for the bonytail on March 21, 1994 (59 FR 13374). These reaches total 499 km (312 mi) as measured along the center line of each reach. Portions of the Green, Yampa, and Colorado Rivers are designated as critical habitat, representing about 14 percent of the species' historic range.

Separate, objective recovery criteria were developed for each of two recovery units (the Upper Colorado and Lower Colorado River Basins as delineated at Glen Canyon Dam) to address unique threats and site specific management actions necessary to minimize or remove those threats. This biological opinion's focus is on the Upper Colorado River Basin recovery unit and will therefore describe the status of the humpback chub in that unit.

2.4.2 Life history

Natural reproduction of bonytail was last documented in the Green River in 1959, 1960, and 1961 at water temperatures of 18°C (Service 2002d). Similar to other closely related *Gila* species, bonytail in rivers probably spawn in spring over rocky substrates. While age at sexually maturity is unknown, they are capable of spawning at 5 to 7 years old. Recruitment and survival estimates are currently unknown because populations are not large enough for research to occur.

Individuals in Lake Mohave have reached 40 to 50 years of age (Service 2002d), but estimates for river inhabiting fish are not available.

2.4.3 Population dynamics

Bonytail are so rare that it is currently not possible to conduct population estimates. In response to the low abundance of individuals, the Recovery Program is implementing a stocking program to reestablish populations in the Upper Basin; stocking goals were met or exceeded from 2008-2010 (Upper Colorado River Endangered Fish Recovery Program and San Juan River Basin

Recovery Implementation Program 2010). Since 1996, over 380,000 tagged bonytail subadults have been stocked in the Green and upper Colorado River subbasins.

To date, most stocked bonytail do not appear to survive very long after release into a given river. To date, the bonytail stocking program has not been as successful as the razorback sucker stocking program. Researchers continue to experiment with pre-release conditioning and exploring alternative release sites to improve their survival. Since 2009, an increasing number of bonytail have been detected at several locations throughout the Upper Colorado River Basin where stationary tag-reading antennas are used. During high spring flows in 2011, more than 1,100 bonytail (16.6 percent of the 6,804 stocked in early April of that year) were detected by antenna arrays in the breach of the Stirrup floodplain on the Green River. The Price Stubb antenna array on the Colorado River detected 138 bonytail between October 2011 and September 2013. The fish detected in fall 2011 had been stocked above Price-Stubb in Debeque Canyon, but in spring 2012, some of those fish were moving upstream through the fish passage.

2.4.4 Threats

The bonytail was designated as an endangered species under a final rule published April 23, 1980 (45 FR 27710–27713). Reasons for decline of the species were identified as the physical and chemical alteration of their habitat and introduction of exotic fishes. The 1990 Bonytail Chub Recovery Plan further stated that the decline of the bonytail chub is attributed to stream alteration caused by construction of dams, flow depletion from irrigation and other uses, hybridization with other *Gila*, and the introduction of nonnative fish species. Hence, the primary threats to bonytail populations are streamflow regulation and habitat modification (including cold-water dam releases, habitat loss, and blockage of migration corridors); competition with and predation by nonnative fish species; hybridization; and pesticides and pollutants (Service 2002d). No new threats have emerged since the 2002 recovery goals were published. The Service's status review of bonytail completed in 2012 (USFWS 2012c) reported that 72 percent of the recovery factor criteria (USFWS 2002d) have been addressed to varying degrees.

Overall, the threats to the bonytail from nonnative fish are similar to those facing the Colorado pikeminnow, as described above. See the discussion on threats to the Colorado pikeminnow above for further information, particularly regarding the threat to all endangered fish due to predation from nonnative species.

No known wild, self-sustaining populations of bonytail exist in the Upper Colorado River Basin. Since listing, bonytail were stocked in the Upper Basin to augment populations, but recruitment and natural reproduction have not been documented. Recent recaptures of bonytail in the Green and Colorado Rivers a year after stocking provide promising results that individuals are surviving.

To summarize, bonytail habitat loss and degradation from dams and diversions constructed decades ago posed some of the early, primary impacts to the species. Most of the long-term impacts from these structures continue and are unlikely to change significantly in the near term. In the remaining suitable habitats, nonnative fish species pose a significant ongoing threat and challenge to recovery. Contaminants may pose a lesser threat as well, but the magnitude of this threat is in need of further investigation.

2.5 Critical Habitat

Critical habitat was designated for all four endangered fish in 1994 (59 FR 13374). It consists of river segments and associated areas within the 100-year floodplain within each species' historical range. Different reaches have been designated for each species, and are discussed for each species within the action area in the Baseline section below. Figure 6 shows critical habitat for the Colorado pikeminnow, which is confined to the upper Colorado River Basin (above Lake Powell). Critical habitats for the other three endangered fish are found in the lower Colorado River Basin as well. Within the upper Colorado River Basin, critical habitats for the other three endangered fish are largely subsets of that designated for the Colorado pikeminnow (i.e., shorter reaches) (see 59 FR 13374 for maps of all critical habitat units designated for each endangered fish).

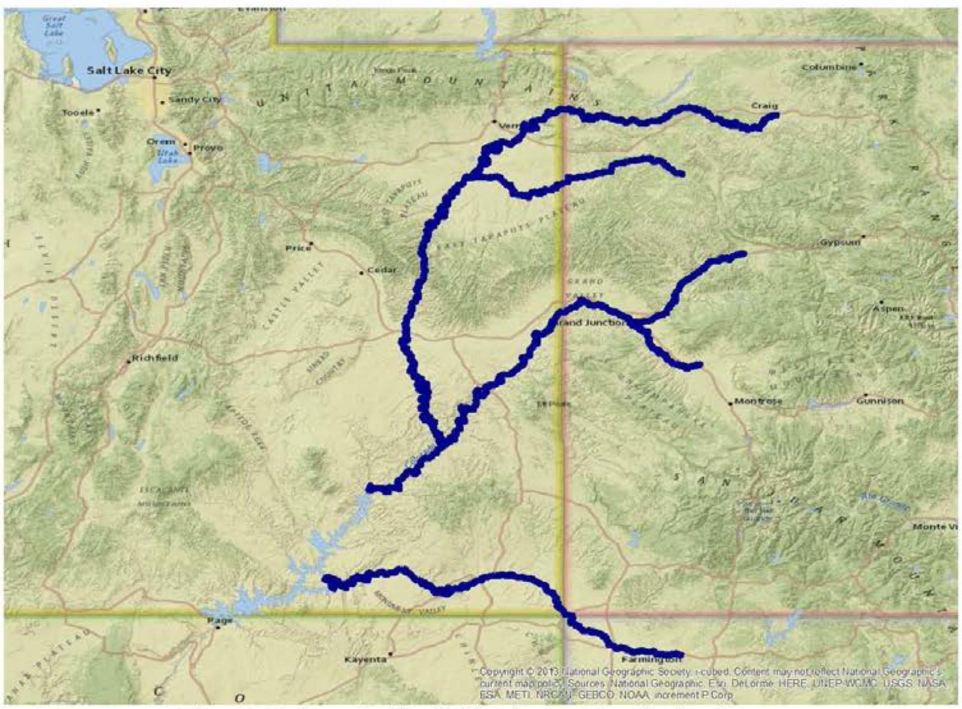

Figure 6. Designated critical habitat for the Colorado pikeminnow.

Critical habitat is defined as specific geographic areas, whether occupied by a listed species or not, that are essential for its conservation and that are formally designated by rule. In the Colorado and elsewhere, many of these critical habitat reaches overlap. Critical habitat for the humpback chub and bonytail are primarily canyon-bound reaches, while critical habitat for the

Colorado pikeminnow and razorback sucker include long stretches of river required for migration corridors and larval fish drift.

Concurrently with designating critical habitat, the Service identified physical and biological features of critical habitat, which are identical for all four endangered fish species. The physical or biological features essential to the conservation of a species for which its designated or proposed critical habitat is based on, include: space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the species historic geographic and ecological distribution. The physical and biological features of critical habitat are the same for each of the four endangered fish within the Colorado River system and include:

Water: a quantity of water of sufficient quality (i.e., temperature, dissolved oxygen, lack of contaminants, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for the species;

Physical habitat: areas of the Colorado River system that are inhabited or potentially habitable for spawning, feeding, rearing, as a nursery, or corridors between these areas, including oxbows, backwaters, and other areas in the 100-year floodplain which when inundated provide access to spawning, nursery, feeding, and rearing habitats; and,

Biological environment: adequate food supply and ecologically appropriate levels of predation and competition.

2.6 Climate Change

The EPA (2015) has predicted that Colorado will experience the following general trends related to climate change (summarized from OSMRE EA, p. 4-19):

- 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.
- Drier conditions will reduce the range and health of ponderosa and lodge pole pine forests, and increase the susceptibility to fire.

Climate change has and will occur and affect endangered species and their habitat over the duration of the Proposed Action and beyond, whether or not the Proposed Action occurs.

Climate change over the coming decades and centuries has the potential to affect many organisms, including freshwater fish. EPA (2015) discussed a change in precipitation patterns, including the timing, intensity, and type of precipitation received; runoff patterns based on the amount of precipitation falling as snow and when snowmelt occurs; and atmospheric temperatures, which exhibit a strong influence on water temperatures.

According to the National Research Council (2012), air temperature has increased by 1.4°C in the last century. The Colorado River Basin has warmed more than any other part of the U.S. (Service 2015c). Drier conditions, warmer air temperatures, and earlier spring runoff peaks are expected to affect water availability and the quality and quantity of fish habitat, which are important elements to native fish in action area. It is impossible to predict with any degree of precision, however, to what extent endangered fish and their habitats will be affected.

However, given that these endangered fish live in main-stem rivers, generally downstream from most of the dams on tributaries within the Upper Colorado River Basin, it is possible that some of the effects of climate change in the area could be moderated by dam releases, particularly if they are done to benefit endangered fish. For example, earlier snow melt and runoff in upper tributaries would influence stream levels above downstream dams, but downstream flows are controlled by dam releases. Warming water temperatures would be counteracted to some extent by cold water releases from the base of a dam. These endangered fish are not cold water dependent fish; cool water temperatures may be more limiting to some or all of them than warm water temperatures (on the up-river limits of their distribution). Higher summer-time base flows as a result of dam releases also work to keep water temperatures from climbing as high as they otherwise would under lower flows. Most or all of the reaches occupied by these endangered fish are influenced by upstream dams.

These dams, whether main-stem dams or on up-basin tributaries, have numerous negative effects on the endangered fish and their habitats. However, in the face of a warming and drying climate, some of the potentially negative effects of climate change (e.g., change in timing of runoff, water temperature increase, drop in base flows) could be ameliorated by dam releases. Alternatively, some of the negative effects of existing dams may be ameliorated by climate change (e.g., warming of below-dam cold waters, a lower water level in Lake Powel resulting in the eventual emergence of more potentially habitable river miles on the Colorado and San Juan Rivers). Aside from the interaction of dams and climate change, increasing water temperatures could potentially extend suitable habitat for one or more of the endangered fish (non-canyon bound species) up river into what may currently be too cold.

See also Climate Change in the Action Area (section 3.4) within the Baseline below.

3.0 ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, State, and private actions and other human activities in the action area; the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal section 7 consultation; and the impact of State or private actions contemporaneous with the consultation process.

The action area is defined at 50 CFR 402 to mean "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the purposes of this consultation, the action area, as defined earlier, has been defined to include the mercury deposition airshed (Figure 7 in BA), along with endangered fish critical habitats within and downstream from the airshed along the Yampa and White Rivers.

3.1 Critical Habitat In The Action Area

The physical and biological features of critical habitat are identical for all four endangered fish species and are discussed in section 2.5 above. Descriptions of critical habitats within the action area are provided below. The BA provides a map of showing critical habitat in the action area.

3.1.1 Colorado pikeminnow

Critical habitat designated for the Colorado pikeminnow along the Yampa River extends from the Highway 13 Bridge over the Yampa River down to the confluence with the Green River. This is an undammed, free-flowing, approximately 145-mile reach. Along the White River, it extends from Rio Blanco Lake down to the confluence with the Green River in Utah. Within this reach, Taylor Draw Dam above the town of Rangely, Colorado, built in 1984, completely blocks fish passage. Although Colorado pikeminnow previously occupied the White River above Taylor Draw Dam, that is no longer the case. Colorado pikeminnow currently occupy the 106-mile reach below Taylor Draw Dam. See Figure 6 in Section 2.5 above.

3.1.2 Razorback sucker

Critical habitat designated for the razorback sucker along the Yampa River extends from the mouth of Cross Mountain Canyon to the confluence with the Green River in Utah. This approximately 55-mile reach is largely within Dinosaur National Monument. Critical habitat has been designated for the razorback sucker along the lower 24 miles of the White River as it travels through the Uintah and Ouray Indian Reservation.

3.1.3 Humpback chub and bonytail

Critical habitats designated for the humpback chub and bonytail along the Yampa River are identical and extend 45 miles from the boundary of Dinosaur National Monument downstream to its confluence with the Green River. No critical habitat has been designated along the White River for the humpback chub or bonytail. Critical habitats for all four endangered fish continue out of the action area downstream along the Green River below its confluence with the Yampa River and below its confluence with the Green River.

3.2 Endangered Fish In The Action Area

Broader population estimates, which may include fish in the action area, are provided above in the Status of the Species section. Additional information specific to the endangered fish populations and their threats in the Yampa and White Rivers is included here.

3.2.1 Colorado pikeminnow

Low numbers of Colorado pikeminnow were captured in the Yampa River during population estimation sampling in 2011-2013. Bestgen et al. (2013, p.4) states, "Captures were particularly low in the Yampa River, where only six Colorado pikeminnow were captured, in spite of high effort associated with northern pike and smallmouth bass removal sampling, as well as regular Colorado pikeminnow sampling passes (up to eight sampling passes)." And for 2013, only 8 Colorado pikeminnow were captured in the Yampa River, in spite of high effort, once again. Preliminary population estimates based on these captures are shown in Figure 7.

A somewhat higher number of Colorado pikeminnow currently occupy the White River. Captures in the White River during population estimation sampling between 2011-2013 ranged from 50-96 fish (Bestgen et al. 2013). Final population estimates based on these captures are not yet available. However, numbers of Colorado pikeminnow have been larger in the past. Adult Colorado pikeminnow abundance estimates in the White River declined from 1,115 animals in 2000 to 465 animals in 2003. Adult Colorado pikeminnow resident to the White River are known to spawn in the Green and Yampa rivers. However, in 2011, researchers documented for the first time Colorado pikeminnow spawning in the White River. Juvenile and subadult Colorado pikeminnow also utilize the White River on a year-round basis (Recovery Program 2015).

As part of the process of revising the 2002 Colorado Pikeminnow Recovery Goals into recovery plans, a recovery team for Colorado pikeminnow was assembled in late 2012 consisting of species and threat experts. During initial discussions in November 2012, the Recovery Team linked persistent low densities of adult Colorado pikeminnow in the Yampa River to persistent high densities of nonnative predators (e.g., smallmouth bass and northern pike; northern pike abundance shown in Figure 7). These estimates, which indicate that northern pike are outnumbering Colorado pikeminnow at least 3:1, point up the ongoing challenge of managing nonnative predators (Service 2015b). A published fish density model (McGarvey et al. 2010) supported the importance of competition among top predators in lotic systems and suggested that partitioning available energetic resources among multiple predator species would inevitably reduce carrying capacity for Colorado pikeminnow. Examination of historic and recent trends in densities of large-bodied Colorado pikeminnow, northern pike, and smallmouth bass in the middle Yampa River suggests that large-bodied invasive predators have functionally replaced Colorado pikeminnow as the river's top predator (Martinez et al. 2014).

The number of adult Colorado pikeminnow residing in the Yampa River has been greatly reduced, largely because of persistent high densities of nonnative predators, and perhaps also because of extended drought (Recovery Program 2015). The Recovery Program initiated a campaign to remove nonnative predators from the critical habitat reaches of the Yampa River in the early 2000s when it became apparent that smallmouth bass were decimating the native fish populations (Anderson 2005). Since that time removal efforts have increased both geographically (now encompassing ~ 170 miles of Yampa River + Catamount Reservoir) and in intensity (with some reaches receiving more than 10 removal passes / yr).

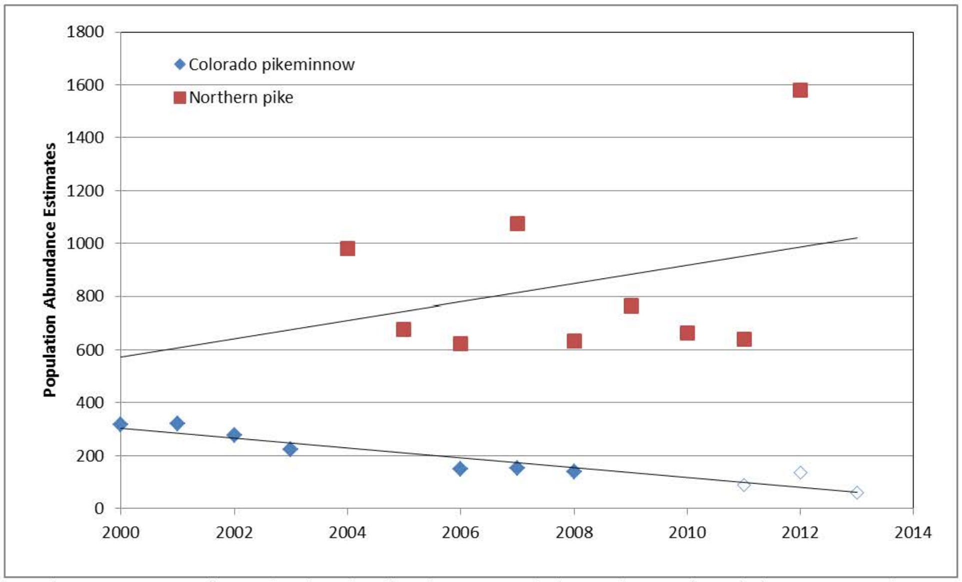

Figure 7. Comparison of Colorado pikeminnow population estimates (CPM) (2000 – 2008 data from Bestgen et al. 2010) and northern pike (Battige 2012) in the middle Yampa River. The 2011-2013 data points for Colorado pikeminnow are preliminary. Northern pike population estimates were not conducted in 2013.

As stated in Martinez et al. (2014), the dramatic decline of native fishes in the Yampa River provides a stark example of the cumulative detrimental impacts of an increase in the number and abundance of nonnative aquatic species, particularly increases in the range and abundance of invasive species including northern pike and smallmouth bass, and virile crayfish *Orconectes virilis*. The Yampa River has been previously described as the "crown jewel" of the upper Colorado River Basin due to its formerly robust native fish populations (Johnson et al. 2008) and its comparatively unregulated hydrograph. It contains designated critical habitat for all four of the endangered fish in the basin. In recent decades, the Yampa River has been progressively invaded by nonnative species, altering the native aquatic community and food web and increasing the threat of invasive impacts to native and endangered fishes (Johnson et al. 2008; Martinez 2014). Examples of these threats include the detection of Asian tapeworm *Bothriocephalus acheilognathi*, hybridization between native sucker species and nonnative white sucker *Catostomus commersoni*, and predation or apparent competition with and hyperpredation on native and endangered fishes (Martinez 2014). Endangered Colorado pikeminnow have steadily declined in the Yampa River, despite pikeminnow increases in four other major population areas in the Green River basin (Bestgen et al. 2010; Martinez et al. 2014). It has become imperative that preventive, eradication and control measures be diligently, vigorously, and more rapidly applied to restore the native aquatic community in the Yampa River (Martinez et al. 2014).

3.2.2 Razorback sucker

Less is known about the numbers of the other three endangered fish within the Yampa and White Rivers. The Yampa River at the mouth of Yampa Canyon was an historical site for razorback sucker reproduction, and in fact, was the first such spawning site described in the Upper Colorado River Basin (McAda and Wydoski 1980, Bestgen 1990). More recently, only a few razorback larvae have been captured in the lower Yampa River in 2000, 2008, and 2011 (Bestgen et al. 2012). Although substantial numbers of razorback sucker do not occur in the Yampa River, scattered individuals can occasionally be found (Bestgen et al. 2012).

Razorback suckers are not stocked into the Yampa River or White Rivers. They are, however, stocked into the Green River and can swim up and into the Yampa or White River. A few substantial captures of adult razorback suckers occurred in the lower White River in 2011. A passive integrated antenna array near the Bonanza Bridge (installed September 2012) demonstrated that razorback sucker and Colorado pikeminnow use the Utah portion of the White River in higher numbers than previously thought. However, a recent expansion of smallmouth bass in the White River is a cause for concern for this native fish stronghold (Recovery Program 2015). In 2011, researchers documented spawning by razorback sucker in the White River for the first time (Bestgen et al. 2012).

The current and increasingly most significant threat to the razorback sucker in the action area is from nonnative species, which is discussed in the Status of the Species section. See also the discussion regarding nonnative species in the Colorado pikeminnow Status of the Species and Baseline sections above, as this threat is similar for all endangered fish in the upper Colorado River basin, particularly regarding predation from nonnative predators.

3.2.3 Humpback chub

The Yampa River humpback chub population exists in the lower Yampa River Canyon and into the Green River through Split Mountain Canyon. This population is small, with an estimate of about 400 wild adults in 1998-2000. Sampling during 2003–2004 caught only 13 fish, too few to estimate population size (Finney 2006). In 2007, the Recovery Program brought 400 young-of-year *Gila* spp. caught in Yampa Canyon into captivity as a research activity to determine the best methods for capture, transport, and holding at two different hatchery facilities. Approximately 15 percent of the *Gila* species were tentatively identified as humpback chub by physical characteristics. Geneticists at Southwest Native Aquatic Resources and Recovery Center (SNARRC), Dexter, NM, have since provided preliminary results indicating that the Yampa fish in captivity were hybrids between humpback chub and roundtail chub. These fish were considered unsuitable for broodstock and were released into the Green River in Dinosaur National Monument. Currently, it is not known if pure humpback chubs occur in Yampa Canyon. The Recovery Program (2015) states that a small population of humpback chub historically existed in the Yampa River in Dinosaur National Monument (Service 2002a), but is now believed to be reduced to a few individuals.

The current and increasingly most significant threat to the humpback chub in the action area is from nonnative species, which is discussed in the Status of the Species section. See also the discussion regarding nonnative species in the Colorado pikeminnow Status of the Species and Baseline sections above, as this threat is similar for all endangered fish in the upper Colorado River basin, particularly regarding predation from nonnative predators.

3.2.4 Bonytail

As stated in the Status of the Species section, wild bonytail are so rare that it is currently not possible to conduct population estimates. However, the Recovery Program is implementing a stocking program to reestablish populations in the Upper Basin. Limited stocking of bonytail has begun recently in the Yampa River and White River (in Utah).

The current and increasingly most significant threat to the bonytail in the action area is from nonnative species, which is discussed in the Status of the Species section. See also the discussion regarding nonnative species in the Colorado pikeminnow Status of the Species and Baseline sections above, as this threat is similar for all endangered fish in the upper Colorado River basin, particularly regarding predation from nonnative predators.

3.3 Contaminants In The Action Area

3.3.1 Mercury

An analysis of mercury deposition and its effects on endangered fish in the San Juan River was recently completed for the Four Corners Power Plant (EPRI 2014). Over 1000 times more coal was involved in the modeling for that effort than under consultation here, but the mechanics of mercury emissions and deposition analyzed there are informative for this consultation. Numerous activities, natural sources, and legacy sources have emitted mercury in the past, and, given that mercury is a global pollutant, we can assume an unknown quantity of that mercury has been deposited in the action area over time. Since the surface area of water is low in the Yampa and White River Basins compared with land area, almost all mercury deposition falls on land, primarily as elemental or ionic mercury. The deposited mercury either evades back to the atmosphere or sequesters to soil. Over time, when overland flow takes place, soil is eroded from the catchment surface and carries adsorbed mercury (e.g., mercury ions; EPRI 2014) with it to the river. A very small portion (about 0.1 percent in the San Juan River, EPRI 2014) of ionic mercury deposited in the watershed enters surface waters. Because of the relatively large amount of past mercury deposited to the soils in a watershed from local, regional and global sources, mercury in water and fish are slow to respond to changes in mercury deposition, including reductions in the deposition of mercury (EPRI 2014). Thus, due to the time it takes for mercury to cycle through the environment, mercury emission and deposition in the action area that may have occurred in the past may continue to affect the listed species and critical habitats today and into the future, and yet are considered part of the environmental baseline.

Water mercury concentrations in the Yampa and White Rivers, which includes all critical habitats in the action area, have not been measured within endangered fish critical habitat in over a decade. Older measurements were made at imprecise detection levels. Water mercury concentrations were tested in the White River above Kinney Reservoir (formed by Taylor Draw Dam) from 1990-1993 (USGS 2015). This reach of the White River is within the action area, as is all of the White River below Rio Blanco Lake, which marks the upper limit of critical habitat for the Colorado pikeminnow. Although total mercury was not detected in 6 of the 8 samples (lab reporting level unknown), the maximum concentration measured was 0.10 µg/L, which is 10 times the chronic aquatic toxicity standard of 0.01 µg/L; the level of concern was listed as High, but clearly more sampling is needed. Chronic toxicity is the development of negative effects as the result of long term exposure to a toxicant or other stressor. It can manifest as direct lethality but more commonly refers to sub-lethal endpoints such as decreased growth, reduced reproduction, or behavioral changes such as impacted swimming performance.

Total mercury concentrations of 0.20 and 0.1 µg/L were also measured in the 1990s in the Yampa River at the Maybell and Craig stations, respectively, although the median values for the datasets were below the detection limit (assumed to be zero) (USGS 2015). Despite occasional high water mercury concentrations, most values were low enough that the Yampa and White Rivers are not listed as impaired for mercury on the EPA 303(d) list (CDPHE 2012b) (all median values were below the detection limit of 0.018 µg/L at the Craig station, unknown limit at the Maybell station). Water mercury concentrations are not currently measured in the Yampa or White Rivers within endangered fish critical habitat.

As explained more fully in the Effects of the Action section below, and provided as reference here, mercury in whole body fish ≤ 0.2 micrograms per gram (µg/g) wet weight (WW) is an approximate threshold below which mercury tissue concentrations can be considered protective of juvenile and adult fish (see Beckvar et al. 2005 and further discussion in Effects of the Action section). Using the Model B regression equation (slope = 0.9048, intercept = -0.2387) developed by Peterson et al. (2005) for the northern pikeminnow (*Ptychocheilus oregonensis*), which is very similar physiologically to the Colorado pikeminnow, this translates to a value of 0.31 µg/g WW in muscle tissue. Muscle tissue is often sampled as muscle plugs—a small, circular, shallow sample of muscle tissue taken from a live fish without significant injury. Osmundson and Lusk (2012) found a range of 0.39 to 0.58 µg/g WW mercury in Yampa River pikeminnow muscle tissue, with a mean of 0.49. Colorado pikeminnow that were captured in the 1960's from the Yampa River and more recently tested had slightly higher mercury concentrations (all archival pikeminnow averaged 0.65 µg/g WW mercury in muscle tissue) (Osmundson and Lusk 2012). Additionally, muscle tissue samples, taken from 4 adult pikeminnow (length 20-26 inches) in the Yampa River in 2006, had levels of mercury between 0.42 and 0.68 µg/g WW, with a mean of 0.56 µg/g (CDPHE 2015).

Within the White River, Osmundson and Lusk (2012) found that mercury concentrations in pikeminnow muscle plugs were higher there than within any other occupied critical habitat unit, with muscle plug concentrations for these fish ranging from 0.43 to 1.83 µg/g WW (Osmundson and Lusk 2012). Roundtail chub (*Gila robusta*) were also tested in the White River as a part of the same study and were found to have elevated mercury levels as well (Osmundson and Lusk 2012). Whole body mercury concentrations in four adult pikeminnow (502-760 mm in length) taken from the White River immediately below Kinney Reservoir in 1986 ranged from 0.31 to 0.96 µg/g (after conversion to wet weight from dry weight (Krueger 1988)). Using the conversion factor derived from Peterson et al. (2005), the 1986 Colorado pikeminnow samples from the White River then ranged from concentrations of 0.50 to 1.75 µg/g WW mercury in muscle tissue (quite elevated). Osmundson and Lusk (2102) state that the White, Green, Colorado, and Yampa Rivers should be placed on the 303(d) list of state impaired waters due to these high mercury concentrations found in fish tissue.

To summarize, Colorado pikeminnow have repeatedly shown elevated mercury concentrations in both the Yampa and White Rivers. Some of the mercury concentrations measured in pikeminnow from the White River have been especially high. After reviewing several studies on mercury toxicity in fish, it is reasonable to assume that some individual Colorado pikeminnow are being adversely affected by elevated mercury tissue residues. However, we do not know what level of impact mercury has had on the Colorado pikeminnow at the population level in the action area in the past. We do not know if it is limiting or preventing successful reproduction, particularly in the White River where mercury levels are higher and reproduction rates are low. Although likely to be lower than Colorado pikeminnow, due in large part, to trophic position, mercury levels have not been tested in the other three endangered fish species.

3.3.2 Selenium

During surface water sampling of the Yampa River between 1997 and 1998, selenium concentrations ranged from; <1 to 4.8 µg/L near Craig, CO < 1 to 4.9 µg/L near Maybell, CO and <1 to 3.6 µg/L near Deerlodge Park, CO (USGS 2001). The peak reported selenium concentrations for these sites occurred in March, possibly during the beginning of the snow runoff. Concentrations were <1 µg/L during May through October. A longer term data set from 1991 to 2011 for the Yampa River below Craig Colorado (USGS Station 09247600) (n=91), showed that close to half of the sample values were reported at less than the laboratory reporting level (0.030 µg/L), and the maximum reported selenium concentration was 17.0 µg/L (USGS 2015). The chronic aquatic life standard for selenium is 5 µg /L total and 4.6 ug/L dissolved (CDPHE 2012a). In sum, historic selenium concentrations measured in the Yampa River below Craig have exceeded the chronic aquatic life selenium standard approximately 10 percent of the time, but are generally below the standard, and this segment is not state listed under 303(d) of the Clean Water Act as impaired for selenium (CDPHE 2012b; USGS 2015).

According to USGS (2015) water sampling in the White River beginning in the 1990s, water selenium concentrations have always remained below the chronic aquatic life standard both above and below Taylor Draw Dam.

Because selenium bioaccumulates in aquatic food chains, selenium concentrations in fish tissue, rather than water, provide a better indication of potential adverse impacts. The available data is limited, but a few studies have provided selenium concentrations measured in fish tissue samples collected from the Yampa and White Rivers. Osmundson and Lusk (2012) reported on selenium in muscle plug samples taken from archival Colorado pikeminnow collected from the Yampa River during 1962-1966, which averaged 7.5 µg/g DW (5.9-10.1ug/g DW). According to Lemly (1995, p.281), these fish would be ranked into the "High" hazard category (after conversion of whole body to egg concentrations), which "denotes an imminent, persistent toxic threat sufficient to cause complete reproductive failure in most species of fish and aquatic birds." Selenium concentrations in muscle plugs taken from five Colorado pikeminnow collected from the Yampa River during 1996 ranged from 1.7-2.8 µg/g DW (mean of 2.3 ug/g DW) (Hamilton et al. 2004) which places them in the "Minimal" hazard category (Lemly 1995). The Minimal hazard

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category which indicates "that no toxic threat is identified but concentrations of selenium are slightly elevated in one or more ecosystem components (water, sediment, invertebrates, fish, birds) compared to uncontaminated reference sites; continued comprehensive environmental monitoring is recommended." Thus, tissue selenium concentrations in Colorado pikeminnow from the Yampa River have varied over time, with earlier values indicating a high hazard and more recent values indicating a minimal hazard.

3.4 Climate Change In The Action Area

We discuss climate change on a global and regional level in the Status of the Species section above (2.6). That discussion includes the action area. In this section we provide further insights into the potential effects of climate change within the action area.

Native fish in the Yampa River could potentially move upstream in response to periods of warming and drying associated with climate change because there is no dam blocking up-river migration. In the White River, however, the Taylor Draw Dam precludes migration to potentially more favorable upstream areas as a behavioral adaptation to changing climatic conditions. The Yampa and White Rivers are at the upper end of the distribution of the endangered fishes within the Colorado River watershed, however. As far as water temperatures are concerned, these fish inhabit warmer waters downstream and are presumably not currently near the upper limit of their temperature tolerances within any given season unless low flows and dry conditions become a problem, which can greatly affect water temperature.

If the modeled predictions of more frequent, more severe, and possibly longer-lasting droughts, along with generally warmer temperatures and less snowfall occur, it will likely become increasingly challenging to meet the established flow recommendations for the protection of listed and native fish in the Yampa and White Rivers (Service 2005, 2013). Reduced flow levels may also exacerbate contaminant issues, as less dilution of contaminants in the river would occur.

Climate change could also affect nonnative fish in the action area, which we believe to be the greatest threat to the endangered fish in the action area. As stated in Martinez et al. (2014), the challenges in restoring and conserving native aquatic species will likely become more difficult due to the interaction of invasive species and climate change. The abundance of nonnative species can increase rapidly under favorable conditions such as low flow prolonged by drought. Reductions in water stores and stream flows due to climate change may intensify demand for remaining water supplies and may hasten proposed water development, including in the Yampa River.

Long-term climate and water development forecasts suggest flow scenarios for the Yampa River that will functionally mimic drought conditions, including reduced stream discharge, smaller stream size, and an increase in summertime water temperatures (Roehm 2004; Johnson et al. 2008). Several invasive species, including green sunfish *Lepomis cyanellus* and largemouth bass *Micropterus salmoides*, have higher thermal tolerances than many of the fish species native to the Colorado River Basin. The projected increase in channel catfish growth rate (McCauley and Beitinger 1992) could increase piscivory by larger catfish in the Colorado River Basin.

Climate change and its effects on water temperature may also alter the dynamics of parasite and disease transmission and host susceptibility, exposing immunologically naïve native fish to outbreaks of pathogens. For example, thermophilic Asian tapeworm *Bothriocephalus acheilognathi* may become more widespread and increase its infection intensity due to higher water temperatures associated with lower summertime flows. Incidence of infection may be higher in small fish and infected fish may grow more slowly, prolonging their exposure to increased infection and predation, and potentially reducing the survival of native cyprinids (Martinez et al. 2014).

Given the uncertainties, however, involved with climate change, including the possibility for both positive and negative effects on endangered fish, particularly at a local level such as the action area, it is currently not possible to predict with any confidence how endangered fish and their habitats will be affected overall. We believe, however, that the primary net effect is likely to be in an increase in the competitive edge for nonnative fish at the expense of native fish, including the four endangered fish in the upper Colorado River Basin. We also believe, however, that in the near term, over the course of the projected coal mining at the Colowyo Mine that is under review, climate change impacts will not be great enough to be readily measurable or have an immediate effect on the endangered fish.

4.0 EFFECTS OF THE ACTION

In this section we analyze the direct and indirect effects of the action on the four endangered fish species and their critical habitats, together with the effects of other activities that are interrelated or interdependent with the proposed action, that will be added to the environmental baseline (per 50 CFR 402.02). Indirect effects are those that are caused by a proposed action and are later in time, but are still reasonably certain to occur. If a proposed action includes off-site measures to reduce or offset net adverse effects by improving habitat conditions and survival, the Service will evaluate the net combined effects of that proposed action and the off-site measures as interrelated actions. Interrelated actions are those that are part of a larger action and depend on the larger action for the justification; 'interdependent actions' are those that have no independent utility apart from the action under consideration (50 CFR 402.02). Future federal actions that are not a direct effect of the action under consideration, and not included in the environmental baseline or treated as indirect effects, are not considered in this consultation.

Analysis challenges

There are many unique challenges to analyzing the effects of the proposed action. They are outlined below:

- We have an estimate as to the amount of mercury released from the combustion of Colowyo coal at the Craig Generating Station, but there is currently a lack of specific information on the amount of selenium released during this process.

- There is currently a lack of reliable information on how much of the emitted mercury and selenium are deposited on the landscape within the action area.

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- There is currently a lack of reliable information on the amount of deposited mercury and selenium that eventually enters occupied and critical habitat and becomes available to be taken up by the four endangered fish species.

- The analysis is confounded by other sources of selenium.

- The analysis is especially confounded by other sources of mercury, a global pollutant, which also contribute to the amounts available to be taken up by the four endangered fish species.

- There is currently a lack of information regarding the specific effects of elevated mercury and selenium on any of the four endangered fish. Assumptions can be drawn only from information relative to other fish species.

These limitations make it very difficult to precisely describe effects to individuals of the four endangered fish species. To satisfy Congress's direction in 7(a)(2) regarding insuring that an action not jeopardize the species, OSMRE and the Service must use the best available information and basic conservation biology principles to explore the overall impact to the populations that are likely to occur and how those effects relate to the likelihood of Jeopardy.

The OSMRE has committed to two different actions to mitigate the effects of their action. One of those (Species Preservation and Recovery Actions Funding, discussed above) will help to improve the status of the species. The second is a study to fill information gaps noted above and to provide data to inform the reasonableness of assumptions that have to be made to move the analysis forward. And as provided for in the regulations, reinitiation of this consultation is triggered if new information reveals effects to the species in a manner or to an extent that was not considered in this analysis.

In the discussion below we describe the effects of the action on the four endangered fish. There are many uncertainties and unanswered questions, however, leading us to necessarily make some reasonable assumptions. Some of these unanswered questions will be addressed through a mercury transport and deposition analysis as described in the conservation measures section above.

In the discussion below we describe the effects of the action on the four endangered fish. There are many uncertainties and unanswered questions, however, leading us to necessarily make some reasonable assumptions. Some of these unanswered questions will be addressed through the mercury fish tissue analysis as described above. As OSMRE states in the BA, the primary impact from coal combustion to threatened and endangered species and their critical habitats is the emission and subsequent deposition of mercury and selenium. We agree, and discuss these effects below.

4.1 Emissions from the Craig Generating Station

4.1.1 Mercury

Mercury is a naturally occurring element. It can be found in soils and the atmosphere, as well as water bodies. Mercury is contained in coal and can be released upon combustion. Atmospheric transport and deposition is an important mechanism for the global deposition of mercury (EPRI 2014), as it can be transported over large distances from its source regions and across continents. It is considered a global pollutant. Atmospheric mercury is primarily inorganic and is not biologically available. However, once this mercury is deposited to the earth, it can be converted into a biologically available form, methylmercury (MeHg), through a process known as methylation. Methylmercury bioaccumulates in organisms and biomagnifies up food chains, particularly in aquatic food chains. Organisms exposed to MeHg in their food can build up concentrations that are many times higher than the ambient concentrations in the environment.

Inorganic atmospheric mercury occurs in three forms:

- Elemental mercury vapor (Hg(0)), also referred to as gaseous elemental mercury (GEM);

- Gaseous divalent mercury, Hg(II), also referred to as reactive gaseous mercury (RGM) or gaseous oxidized mercury;

- Particulate mercury, Hg(p), also referred to as particle bound mercury (PBM); PBM can be directly emitted or can form when RGM adsorbs on atmospheric particulate matter.

In the global atmosphere, Hg(0) accounts for more than 90 percent of total mercury, on average, while both RGM and PBM typically account for less than 5 percent (EPRI 2014). The reactive form of mercury (RGM) is often deposited to land or water surfaces much closer to their sources due to its chemical reactivity and high water solubility. PBM is transported and deposited at intermediate distances depending on aerosol diameter or mass. Within the atmosphere, numerous physical and chemical transformations of mercury can occur depending on many factors.

The various forms of mercury have very different physical and chemical characteristics, resulting in large differences in their removal rates from the atmosphere, and consequently, in their atmospheric lifetimes (EPRI 2014). GEM has a lifetime on the order of several months to more than a year because of its low reactivity, low water solubility, and slow deposition rate. Thus, it is considered a global pollutant since it is transported over long distances. On the other hand, the lifetimes of both RGM and PBM are much smaller, ranging from a few hours to days, because they are removed efficiently by dry and wet deposition, particularly RGM. Thus, mercury is a pollutant at all scales ranging from global to local.

Mercury is emitted by both natural and anthropogenic sources. Natural sources include volcanoes, geothermal sources, and exposed naturally mercury-enriched geological formations. These sources may also include re-emission of historically deposited mercury as a result of evasion from the surface back into the atmosphere, fires, meteorological conditions, as well as changes in land use and biomass burning. Anthropogenic sources of mercury include burning of fossil fuels, incinerators, mining activities, metal refining, and chemical production facilities.

Once mercury is emitted from the smoke stacks at the Craig Generating Station it is transported some distance through the atmosphere before deposition on the land scape takes place. Apportioning the deposition of mercury based on emissions from multiple emissions sources is a complicated endeavor. Currently no requirement or program exists for modeling the source apportionment of mercury emissions. Regional scale photochemical modeling that accounts for simulated chemical transport, dispersion within the atmosphere, and chemical interactions of pollutants within the atmosphere are required for such an effort. As stated in section 1.4 above, an effort to conduct such a mercury deposition modeling effort in the Yampa River Basin has begun recently, conducted by EPRI and funded by Colowyo and Tri-State. Results of that study will aid in planning for the recovery of endangered fish and other listed species potentially affected by mercury contamination in the Yampa and White River Basins.

While mercury emission and subsequent deposition occurs at varying spatial scales (i.e., globally, nationally, and regionally), this consultation evaluates the potential for mercury emitted from the combustion of Colowyo coal from the Collom expansion area at the Craig Generating Station and its possible impact to the Colorado River Fish and their habitat. Two coal fired power plants operate in the region; the Craig Generating Station is located near Craig, Colorado and the Hayden Generating Station is sited approximately four miles east of Hayden, Colorado (21 miles east of the Craig Generating Station).

According to the BA, pursuant to the proposed project (Permit PR-04), a total of approximately 78 million tons of coal would be recovered from the Collom Lite Pit. At an approximate maximum production rate of 5.0 million tons per year (mtpy), this would result in a lifespan of approximately 15.6 years for the project.

As stated in the BA, the Craig Generating Station employs mercury emissions controls, which remove a large amount of the mercury contained in the coal. Based on data from the EPA, the Craig Generating Station has emitted between 30 and 130 lbs of mercury annually between 2007 and 2013 (130 lbs in 2007 and 2008, 30 lbs in 2009, 43 lbs in 2010 and 2011, 44 lbs in 2012 and 42.4 lbs emitted in 2013 [the last year data is available]) (NAPD 2015). Between 2008 and 2009, the reported amount of mercury emitted dropped significantly due to a change in the method of calculation. Actual data from emissions testing has shown that the previously used EPA emission factors overestimated the amount of mercury emissions being reported.

Currently about half of the coal burned at the Craig Generating Station is produced from the Colowyo Mine with roughly the remaining half produced from the Trapper Mine. However, for the purpose of this analysis, it will be assumed that all of the coal combusted in a given year is produced from the Colowyo Mine. This would result in theoretically implementing the maximum production rate scenario of 5.0 mtpy, which is essentially equivalent to the total coal combusted at the Craig Station in 2005 (i.e. 5.02 mtpy). Assuming a 5.0 mtpy maximum of coal combusted at the Craig Generating Station from the Colowyo Mine and with the latest emission factors at the Craig Generating Station, 47 lbs of mercury would be emitted annually from coal coming from the project (OSMRE 2015a). At this mining and combustion rate (5 mtpy), approximately 733 total lbs of mercury would be emitted through combustion over the life of the project (15.6 years x 47 lbs/year = 733.2 lbs).

According to the BA, it is not likely that mercury emissions from the Craig Generating Station would be affected if the Collom Project did not go forward given that the Craig Generating Station can access other sources of coal and has done so in the past in order to meet electricity generation requirements. Therefore, the 47 lbs/year of mercury emissions estimated for the project should not be interpreted as an estimate of a decline in emissions that would result if the Collom Project did not go forward. Nor should it be interpreted as a net increase to regional coal combustion if the Collom project would proceed as proposed. If coal was not provided by the Colowyo Mine, the Craig Generating Station would likely contract with other mines to supply the coal needed (OSMRE 2015a).

No current data or modeling are available to indicate how much of the mercury that is *emitted* by either the Craig Station or the Hayden Station is *deposited* annually within the airshed used in this assessment. However, a recent contaminant modeling effort conducted for the Four Corners Power Plant and Navajo Mine Energy Project (FCPP & NMEP) (EPRI 2014) included detailed modeling of the emissions and deposition of mercury produced at the Four Corners Power Plant. In those models, it was determined that approximately 95 percent of all mercury emitted by the Four Corners Power Plant rises high enough into the atmosphere to be carried by prevailing wind currents out of the local area analyzed in that effort. Although environmental conditions at the Craig Generating Station may be somewhat different, and our analysis here involves a smaller amount of coal to be combusted, that modeling effort provides a roughly comparable situation that will assist us with our analysis.

Assuming a five percent local mercury deposition rate, 2.35 lbs of mercury would be deposited in the local action area each year from the combustion of the proposed Collom project coal at the Craig Generating Station (47 lbs x 0.05 = 2.35 lbs). Over the proposed life of the project (15.6 years), this would equate to 36.7 lbs of locally-deposited mercury (2.35 lbs x 15.6 years = 36.7 lbs).

An alternative method of estimating the amount of mercury that would be deposited from the proposed project can be derived from an examination of a local mercury deposition monitoring site. A Mercury Deposition Network (MDN) monitoring site is located in Routt County just east of Steamboat Springs on Buffalo Pass. It is at the eastern edge of the airshed analyzed for this project (see Fig. 4 in BA). These monitoring stations measure the levels of mercury that are deposited during precipitation events (i.e. wet deposition). The Buffalo Pass site is the nearest MDN receptor to the action area. The Craig Generating Station is approximately 45 miles west of the Buffalo Pass MDN site. This site has provided data on the wet deposition of mercury to the MDN since 2007. Data from this station in 2013 indicated that there was an annual deposition of 9.757 μg/m2 of mercury at that location (NAPD 2015).

Using the results of the emission and deposition modeling conducted at FCPP as a possible scenario, and assuming that the average annual deposition of 9.757 μg/m2 of mercury is equally distributed throughout the Yampa and White River watersheds (a combined total of 34,362 km2); an annual deposition of 335.27 kg of mercury is calculated. The entirety of the mercury deposition airshed is within these two watersheds and is approximately 10,500 km2 (BA, Figure 7) or 30.6 percent of the combined watersheds. Therefore, assuming an even distribution of mercury deposition, there would be an approximate total of 102.6 kg of mercury deposited annually over the airshed. However, if the results of the FCPP & NMEP model are used, then only five percent of the mercury deposited would be emitted from local sources and the other 95 percent would come from global or other distant sources. If we assume that all locally-deposited mercury comes from the two coal-fired power plants (likely an overestimate), this would indicate that the proportional amount of mercury deposited annually that comes from the two local generating stations is 5.13 kg (5 percent from local sources) across the entire Action Area (102.6 kg x 0.05 = 5.13 kg) (5.13 kg = 11.3 lbs).

The proportion of local mercury attributable to the Craig Generating Station can be estimated by comparing the ratio of coal that is combusted amongst the two generating stations. According to the BA, the Craig Generating Station emits 42.4 lbs of mercury per year, and the Hayden Generating Station emits 16.5 lbs of mercury per year (i.e., the Craig Generating Station emits 72 percent of total mercury emitted by both generating stations). Using these numbers, the Craig Generating Station would contribute 8.1 lbs of local mercury (0.72 x 11.3 lbs = 8.1 lbs), and the Hayden Generating Station would contribute 3.2 lbs of local mercury (0.28 x 11.3 lbs = 3.2 lbs). It is worth noting that, due to the prevailing winds generally being west to east in the action area, more of the mercury emitted by the Craig Generating Station is likely to be deposited east of Craig than to the west (i.e., further upstream along the Yampa and White Rivers than where endangered fish critical habitats are located).

It is also important to note that the calculations above are in reference to wet deposition of mercury. Some research has shown that dry deposition can be equal to or greater than wet deposition. Research has shown this rate to be anywhere from 0.8 to 4.8 times higher in the central and eastern United States (Zhang et al. 2012). The rate of dry deposition is highly dependent on the meteorological conditions and the chemical speciation of the mercury. Although most all of the sites analyzed in Zang et al. (2012) were in the eastern United States with more precipitation than that experienced in western Colorado, one site analyzed was in Salt Lake City, Utah. At that site, total mercury was 2.5 times that of the wet deposition of mercury (Zhang et al. 2012). Applying this factor to the Collom expansion area coal that is combusted at the Craig Generating Station provides a total mercury deposition of 20.3 lbs (8.1 lbs x 2.5 = 20.3) in the Action Area from the proposed action.

We see that estimating the amount of mercury locally deposited from the combustion of the proposed Colowyo coal using emissions data from the Craig Generating station (and assumptions regarding local deposition), results in a smaller estimate of locally deposited mercury from the project (2.35 lbs/yr) than that obtained from the estimate using the mercury deposition data at the MDN site (and associated conservative assumptions regarding mercury sources) (20.3 lbs/yr). In terms of volume, this translates to between 2.7 and 23 fluid ounces of mercury per year from the project, if it were to be consolidated.

4.1.2 Selenium

In addition to mercury emissions from the combustion of coal, another element known to be emitted is selenium. Selenium, a trace element, is a natural component of coal and soils in the region. While it may be released during combustion, it is not monitored at coal combustion stations to the same degree as mercury. No estimate as to the amount of selenium emitted annually and potentially deposited into the area was made in the BA. However, when Colowyo coal was last tested in March of 2015, it contained below 1 microgram of selenium per gram of coal (µg/g), which was the detection limit (OSMRE 2015a).

When selenium is present in flue gas after combustion, it tends to behave much like sulfur and is removed to some extent via the Sulfur dioxide (SO_2) air scrubbers in place and also absorbs onto alkaline fly ash that is subsequently removed by a fabric filter bag house (EPRI 2008). Nevertheless, combustion of coal at the Craig Generating Station could result in some amount of selenium moving beyond pollution control processes, being emitted, and subsequently deposited on the landscape.

Given that selenium emissions are not monitored at the Craig Generating Station while mercury emissions are, and the fact that mercury is a more toxic element and more likely to cause adverse effects to the endangered fish in the action area, our analysis hereafter is focused first and foremostly on mercury.

4.2 Discharge (Runoff) from the Colowyo Mine

The Colowyo Mine has been in operation for many years, first as an underground coal mine, then as an open pit mine starting in 1977. Mine discharge may have contained some level of mercury and selenium since mining began. Past and current discharge levels from the Colowyo Mine up to this point are considered part of the baseline; this includes the South Taylor/Lower Wilson area, which is currently being mined, and runoff from the Collom expansion area, which has not yet been mined.

4.2.1 Mercury

In addition to the potential for mercury to be deposited from coal combustion at the Craig Generating Station, mercury may also be released from water discharges directly from the mine, which ultimately drain into the Yampa River. Water discharge is specifically managed under Colowyo Mine's NPDES permit issued by the EPA. However, under the EPA NPDES standard, discharge water is not typically monitored for mercury levels. During the renewal process of the NPDES permit every five years, the EPA may require that a permit holder sample for mercury (or other contaminants not normally sampled for) if contamination is demonstrated (e.g. abnormally high levels shown from other sampling efforts, such as the Colorado Division of Reclamation Mining and Safety (CDRMS) sampling discussed below). To date, Colowyo has not been required to do so by the EPA, according to the BA.

The CDRMS, which issues the state mining permit, does not require that discharges from ponds be monitored for mercury and does not set limits on the amount of mercury that can be discharged from the ponds. CDRMS does, however, require mercury analyses of samples from points on receiving waters upgradient and downgradient of a mine, when a permit is first written. The operator is required to develop a monitoring plan for receiving waters; this includes background data (before mining), upstream sample points, and downstream sample points, including groundwater.

Three surface water monitoring stations are in place downstream of potential discharge points from the active portion of the Colowyo Mine. All permitted discharge points first flow into sediment ponds. Two of the locations are found in Good Spring Creek (sampling points: Lower Good Spring Creek and New Upper Good Spring Creek), and the other is in Taylor Creek (sampling point: Lower Taylor Creek). The fourth point is upstream of the mine in the West Fork of Good Spring Creek (sampling point: Upper West Fork of Good Spring Creek). When CDRMS staff review annual hydrology reports that contain the data for receiving waters, they compare this data to CDPHE standards (Regulation 31, The Basic Standards and Methodologies for Surface Water). Prolonged or extreme exceedances of the mercury standard could result in the writing of a violation of the permit.

Regarding discharge volume, most discharge locations from the Colowyo Mine do not have regular flow. The Taylor Creek discharge point, however, has a constant flow into Taylor Creek of 0.039 cubic feet per second, on average. The discharge flow is the result of drainage through an underdrain structure below the West Taylor fill, which is immediately up-gradient of the West Taylor settling pond, which then drains to the discharge point.

According to the BA, samples collected at these sampling locations and analyzed for mercury, according to EPA method 245.1, have reported mercury levels of 0.001 milligrams per liter (mg/L). This is also the state mandated detection level for mercury under the current South Taylor/Lower Wilson mining permit. All mercury levels at the four locations, above and below the mine, have been reported at this level since 2008. According to the BA, this almost certainly indicates that mercury could not actually be detected in these samples. However, the detection limit (0.001 mg/L = 1.0 ug/L) is 100 times greater than the chronic aquatic life water quality standard of 0.01 ug/L (CDPHE 2012b).

The Collom expansion area occurs to the west of the South Taylor/Lower Wilson mining area, and drains into the upper portions of adjacent, yet different creeks—Collom Gulch and Jubb Creek. Baseline water quality monitoring began in these creeks in 2011. The mercury concentration in each of these creeks was also reported at the detection limit. Therefore, pre-disturbance surface water draining from the Collom expansion area may not contain any mercury, or may be contributing some amount less than 1.0 μg/L.

Using these data, it is not possible to determine whether or not there is a small amount or no amount of mercury being released from Colowyo Mine discharge (or from the undisturbed Collom expansion area). We can only say that mine discharges may be releasing mercury that may ultimately reach the Yampa River at some concentration less than 0.001 mg/L in minor flows that average less than one tenth of one cubic foot per second.

Based on current mine discharge data, we believe it is reasonable to assume that the amount of mercury released in future mine discharge from the Collom expansion area once mining begins, if any, would be small in comparison to the mercury released into the environment through eventual combustion of the coal. The Yampa River is not listed on the EPA 303(d) list of impaired waters for mercury, including the reach of the Yampa River downstream from confluence of the tributary watershed containing the Colowyo Mine (USGS water quality data station near Maybell); this reach of the Yampa River is designated critical habitat for the

Colorado pikeminnow. Although the data is incomplete (USGS 2015), it does not appear that mercury concentrations in Colowyo Mine discharge, if any, are high enough to impair the Yampa River.

Unrelated to the current project, another nearby coal mine (Trapper Mine) has funded an effort by USGS to obtain water quality samples beginning in 2016 in the Yampa River at points both above and below the confluence of Milk Creek, the watershed containing the Colowyo Mine. Both selenium and methyl mercury concentrations will be tested at very precise detection levels. Given past water quality values in the Yampa River and water quality test results in tributaries surrounding the Colowyo Mine, we do not expect future discharge from the project to significantly influence water mercury concentrations in the Yampa River. We will examine future water quality testing results to verify this assumption.

4.2.2 Selenium

Selenium in surface waters has been tested in tributaries surrounding the active portion of the Colowyo Mine both before and after approval of the South Taylor/Lower Wilson mining plan (2008). Dissolved selenium rates ranged from 1 μg/L to 36 μg/L in samples taken between 1983 and 2006 in three streams near the mine (OSMRE 2015b). Note that, as stated above, surface mining began at the Colowyo Mine in 1977. Sampling after 2007 has shown a range of 5 μg/L to 20 μg/L in these same tributaries plus one additional site near the mine. All sites are at or greater than the chronic aquatic life standard criterion for selenium, which is 5 μg/L total and 4.6 μg/L dissolved (CDPHE 2012a). Some values also exceed the acute selenium concentration standard in Colorado of 18.4 μg/L (CDPHE 2012a).

The mine's National Pollution Discharge Elimination System (NPDES) permit does not include an effluent limit for selenium. This permit expired and was administratively extended in 2010 and is still currently under administrative extension. As required, CDPHE completed a water quality assessment for the COLCLY03e area, which includes the nearby Good Spring Creek and Wilson Creek tributaries adjacent to the active mine, and determined no effluent limitations for selenium were required. CDPHE also determined that COLCLY03e is Use Protected and not subject to antidegradation requirements, although selenium monitoring is required (OSMRE 2015b).

Currently monitored selenium levels in surface waters surrounding the Collom Project range between 5 and 15 μg/L (BA, Table 5). Therefore, it can be stated that the pre-surface disturbance water quality from the Collom Project meets the state acute standard, but not the chronic standard, for aquatic life protection.

Although selenium concentrations in the tributaries adjacent to the mine are not protective of fish, including from the undisturbed Collom expansion area, the Colowyo Mine is approximately 9 miles from Colorado pikeminnow occupied and critical habitat in the Yampa River. Although dissolved selenium is readily transported downstream, selenium concentrations in the water flowing from the small tributaries surrounding the mine would be diluted as they combine with other tributaries (e.g., Milk Creek; assuming a lesser selenium concentration) and particularly upon entering the Yampa River. Selenium concentrations were measured in the Yampa River near Maybell (USGS Station 09251000) from 1990-2003. This monitoring station is below the Yampa River's confluence with Milk Creek and its watershed, which receives drainage from the Colowyo Mine and the tributaries surrounding it. Selenium concentrations were also measured from 1991-2013 upstream in the Yampa River at the Craig monitoring station (USGS Station 09247600), which is at the upper end of critical habitat for the Colorado pikeminnow and above any influence of Colowyo drainage. At both monitoring stations in the Yampa River, one above and one below the influence of drainage from the Colowyo mine, median selenium concentrations of less than 1 µg/L, and 85th percentile concentrations below the chronic aquatic life standard, were measured. As stated above for mercury, we do not expect future discharge from the project to significantly influence water selenium concentrations in the Yampa River. We will examine future water quality test results provided by the USGS to verify this assumption.

4.3 Effects to Endangered Fish

4.3.1 Mercury

Mercury is an environmental contaminant that can have adverse effects on riparian and aquatic wildlife (Scheuhammer et al. 2012; Wentz et al. 2014). Elevated levels of mercury in living organisms in mercury-contaminated areas may persist for as long as 100 years after the source of pollution has been discontinued (Eisler 1987). Eisler (1987, p. iii) states:

> Most authorities agree on six points: (1) mercury and its compounds have no known biological function, and the presence of the metal in the cells of living organisms is undesirable and potentially hazardous; (2) forms of mercury with relatively low toxicity can be transformed into forms of very high toxicity, such as methylmercury, through biological and other processes; (3) mercury can be bioconcentrated in organisms and biomagnified through food chains; (4) mercury is a mutagen, teratogen, and carcinogen, and causes embryocidal, cytochemical, and histopathological effects; (5) some species of fish and wildlife contain high concentrations of Hg that are not attributable to human activities; (6) anthropogenic use of Hg should be curtailed, as the difference between tolerable natural background levels of Hg and harmful effects in the environment is exceptionally small.

Aquatic systems receive mercury by direct deposition from the atmosphere and from overland transport from within the watershed (EPA 1997). Mercury primarily enters aquatic systems in an inorganic form where it can adsorb to suspended solids and settle to the bottom (EPA 1997). It can also be photo reduced in the upper few centimeters of the water's surface and then evade to the atmosphere. RGM at the sediment water boundary can be transformed into MeHg by sulfate-reducing bacteria, but this process can also go the other direction, depending on site-specific conditions. The most important areas for methylation are anoxic areas of the aquatic environment, such as wetlands or poorly mixed aquatic areas. The vast majority of mercury in fish tissue is in the form of MeHg (EPA 1997). Rates of methylation processes and bioaccumulation typically vary and depend on many factors.

The potential effects of mercury on fish are numerous. Lusk (2010) describes the potential affects as:

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1. Potent neurotoxin:
   a. Affects the central nervous systems (reacts with brain enzymes, then lesions);
   b. Affects the hypothalamus and pituitary, affects gonadotropin-secreting cells;
   c. Altered behaviors: Reduced predator avoidance, reproduction timing failure;
   d. Reduced ability to feed (emaciation and growth effects).
2. Endocrine disruptor
   a. Suppressed reproduction hormones in male and female fish;
   b. Reduce gonad size and function, reduced gamete production;
   c. Altered ovarian morphology, delayed oocyte development;
   d. Reduced reproductive success;
   e. Transfer of dietary Hg of the maternal adult during oogenesis and into the developing embryo.
3. Inability to grow new brain cells or significantly reduce brain mercury.

Mercury contamination is a widespread problem across the United States. Nearly half of all lakes and reservoirs in the country are above the human health screening value for mercury (EPA 2009). The vast majority (97 percent) of health advisories issued by the EPA for the consumption of fish from lakes and reservoirs in 2008 were due to mercury, PCBs, dioxins and furans, DDT, and chlordane. Of these contaminants, mercury was by far the most commonly detected. Of the predacious fish sampled (as opposed to bottom-dwellers), 48.8 percent of the sampled population of lakes across the country had mercury tissue concentrations that exceeded the 0.3 micrograms per gram (parts per million) human health screening value for mercury, which represented a total of 36,422 lakes (EPA 2009).

4.3.3.1 Colorado pikeminnow

Of the four endangered fish in the Yampa and White Rivers, we expect the Colorado pikeminnow to be at greatest risk from exposure to mercury that has been deposited within the Yampa and White rivers from *project-related* emissions from the Craig Generating Station. This is due to two factors. First, Colorado pikeminnow have a higher likelihood of bioaccumulating mercury. Predatory organisms at the top of the food web generally have higher mercury concentrations in their bodies because mercury tends to biomagnify up through the food chain and concentrate in upper trophic levels (EPA 1997). Unlike the other three endangered fish, the Colorado pikeminnow is a top predator and is almost entirely piscivorous once it grows to be 80-100 mm (3 to 4 inches) long (Vanicek and Kramer 1969). The Colorado pikeminnow is also a long-lived fish, living 55 years or more (Osmundson et al. 1997). Thus, mercury will accumulate more rapidly and over a longer time period than in the other three endangered fish species.

Second, Colorado pikeminnow occupy habitats closer to the Craig Generating Station than the other endangered fish and would, therefore, be exposed to the highest concentrations of mercury resulting *from the project*. Critical habitats designated for each endangered fish were based on areas of known occupancy. Only critical habitat designated for the Colorado pikeminnow is found within the airshed identified for analysis, centered around the Craig Generating Station. The other three endangered fish and their critical habitats are found lower down in and along the Yampa River (razorback sucker, humpback chub, bonytail), and lower down in and along the

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White River (razorback sucker). We expect the contribution of mercury from the Craig Generating Station in the Yampa and White Rivers to diminish with distance from that point source through dilution (from additional water entering from tributaries) and removal (through biological uptake and potential adsorption to sediments).

Beckvar et al. (2005) suggested a threshold-effect level of ≤ 0.2 micrograms per gram (μg/g) wet weight (WW) mercury in whole body fish as being generally protective of juvenile and adult fish; concentrations below this level would not result in <u>any</u> detectible effects to these fish. To be able to compare concentrations in muscle tissue with whole body tissue, estimates have been calculated using the Model B regression equation and the intercept developed for Northern pikeminnow presented in Peterson et al. (2005), as explained earlier in the Environmental Baseline section. Using this equation, a concentration of 0.2 μg/g WW in whole body fish translates to a value of 0.31 μg/g WW in muscle tissue.

More recently, after an examination of numerous mercury studies, Sandheinrich and Wiener (2011) stated that freshwater fish begin to exhibit sub-lethal, yet detectible negative effects through changes in biochemical processes, damage to cells and tissues, and reduced reproduction at methylmercury concentrations of about 0.5-1.2 μg/g WW mercury in muscle tissue (0.3-0.7 μg/g WW mercury in whole body fish). They state that nearly all mercury in fish is in the form of methylmercury, as this is the form that bioaccumulates and biomagnifies up through the food chain. Note also that the EPA human health consumption advisory is 0.3 μg/g/day of mercury (WW) in fish tissue (EPA 2001).

As stated in the Environmental Baseline section above, we have historic information on the mercury concentrations found in Colorado pikeminnow tissue that were collected in the Yampa and White Rivers, but are lacking this historic data for the other three endangered fish. The mercury concentrations reported by Osmundson and Lusk (2012) ranged from 0.39 to 0.58 μg/g with a mean level of 0.49 μg/g in muscle plug samples taken from Colorado pikeminnow in the Yampa River (9 fish sampled 2008-2009). Prior to that, muscle plug samples taken from Colorado pikeminnow in the Yampa River in 2006 had concentrations of mercury between 0.42 and 0.68 μg/g (CDPHE 2015). Earlier still, Osmundson and Lusk (2012) reported on the mercury concentrations in muscle plugs taken from archival pikeminnow collected in the Yampa River during 1964-1966, which measured 0.41-0.88 μg/g total mercury. Most of these mercury concentrations are above the effects threshold suggested by Beckvar et al. (2005) (muscle tissue equivalent) at 0.31 μg/g, but are below or at the concentrations identified by Sandheinrich and Wiener (2011) where negative effects would become detectible (0.5-1.2 μg/g).

Osmundson and Lusk (2012) found that mercury concentrations in White River Colorado pikeminnow were higher than concentrations in Colorado pikeminnow in other river segments of critical habitat. They found a mean muscle tissue concentration of 0.95 μg/g in White River pikeminnow with a range of 0.43 to 1.83 μg/g (Osmundson and Lusk 2012). Colorado pikeminnow taken from the White River over 20 years earlier was reported at 0.5 to 1.75 μg/g of mercury in muscle tissue WW by Krueger (1988) (after conversion from whole body dry weight). The measured mercury concentrations indicate that some individuals of this endangered fish species with higher mercury concentrations have exceeded toxicity measurement thresholds and have mercury concentrations at a level where sub-lethal harmful effects become measurable in many other fish species (Sandheinrich and Wiener 2011).

Based on these results, we expect that some Colorado pikeminnow in the action area may already be experiencing chronic, sub-lethal harmful effects, such as potentially reduced reproductive success or reduced vigor, from elevated mercury concentrations. It should be noted, however, that piscivorous fish living in fresh waters in the midwestern and eastern United States, and some waters in the western United States contaminated by mining activities, have been reported to contain concentrations exceeding 1.0 µg/g WW in muscle tissue (Sandheinrich and Wiener 2011). Thus, harmful effects to predatory fish from mercury are not isolated to this action area, but are part of a geographically widespread problem. These studies indicate that while harmful effects may begin to be measurable in individual fish with concentrations of 0.5 µg/g WW in muscle tissue, or possibly less, some adult fish can persist with muscle tissue concentrations exceeding 1.0 µg/g (WW) (Sandheinrich and Wiener 2011). At these levels they would presumably be exhibiting sublethal effects, such as those described below.

The harmful effects of methylmercury on fish populations at existing exposure levels in many North American freshwaters would be sub-lethal, such as cellular damage, reduced vigor, and reduced reproduction. Direct mortality due to methylmercury has been observed only at high concentrations (6-20 µg/g WW in muscle) (Sandheinrich and Wiener 2011).

Rather than direct mortality, we expect that chronic toxicity from exposure to mercury in the action area may be affecting the endangered fish, as discussed below. Chronic toxicity is the development of negative effects as the result of long term exposure to a toxicant or other stressor. It can manifest as direct lethality but more commonly refers to sub-lethal endpoints such as decreased growth, reduced reproduction, or behavioral changes such as impacted swimming performance.

Data from the Colorado Department of Public Health and Environment, Water Quality Control Division maintains a list of all waters in Colorado that exceed the total maximum daily loads for a variety of contaminants (CDPHE 2012b). Maintenance of this list is in accordance with Section 303(d) of the Federal Clean Water Act. The Water Quality Control Division does not list the Yampa or White Rivers as impaired for mercury levels. It should be noted, however, that impairment under this program relates to risk to humans and not necessarily to risk to aquatic species.

As stated above, we know that the combustion of coal from the Colowyo Mine at the Craig Generating Station is releasing mercury into the air and we have an estimate of this quantity. We do not know specifically, however, what proportion of that mercury deposits within the action area, the greater Yampa or White River watersheds, or is transported to distant locations beyond the limits of the local watersheds, although we have made a reasonable assumption of this amount.

Although not fully understood or quantified, we believe the primary impact from coal combustion to the Colorado River fish is from the emission and subsequent deposition of mercury and eventual integration into fish tissue. Mercury poses a greater threat to the Colorado pikeminnow, as compared to the other endangered fish in the action area, and a greater threat than selenium, which is discussed below. Mercury has no beneficial use at any concentration for vertebrates and is considered toxic at much lower tissue concentrations than selenium. The chronic aquatic life standard for mercury concentrations in water is more than two orders of magnitude smaller than that for selenium. In most endangered fish tissue samples analyzed from the action area, mercury was close to or somewhat above the more conservative safe tissue level presented by Beckvar et al. (2005) and some also above the higher risk threshold presented by Sandheinrich and Wiener (2011). As discussed below, selenium tissue concentrations tested in the action area have ranged from levels indicating a minimal hazard to those indicative of a high hazard.

It is possible that the mercury concentrations measured in Colorado pikeminnow might result in a minor reduction of vigor through reduced mental and physical reaction times, which would impact their ability to escape predation from northern pike, smallmouth bass, or other piscivorous predators. Reduced swimming ability could also lead to a reduction in feeding success (i.e., capturing other fish to eat). However, the nonnative competitors and predators in the action area, such as northern pike and smallmouth bass, are experiencing the same water mercury concentrations and therefore may not have a significant competitive advantage or increased predation success over Colorado pikeminnow in the presence of elevated mercury. There is also evidence, however, that different predaceous fish species bioaccumulate mercury at different rates even within the same river segment due, in part, to differences in fish physiology and diet (CDPHE 2015, MacRury et al. 2002, EPA 2004). In fact, CDPHE (2015) found average mercury levels in Colorado pikeminnow adults were more than twice as high as northern pike adults in the Yampa River, although the sample size was small and different river segments were sampled for each species (CDPHE 2015).

Despite the uncertainties outlined above, we can come to basic conclusions regarding the effect to endangered fish from the mining of coal and its eventual combustion. Given fish tissue mercury concentrations have been determined to be elevated in Colorado pikeminnow from both the Yampa and White Rivers, but in particular in the White River, and coal mining and local combustion adds mercury to the system, this additional mercury adds to any negative effects resulting from mercury exposure. Based on the best available science, we believe some Colorado pikeminnow individuals are experiencing low, chronic negative health effects from mercury already in the action area. The mercury added by this project will add to the effects of this chronic condition, although the relative contribution of project-related mercury is assumed to be a very small percentage of the total mercury that has been and will continue to be deposited in the action area, as explained above.

Additionally, as stated in the Baseline section above, mercury concentration measurements have been higher in Colorado pikeminnow taken from the White River than from the Yampa River despite the fact that there are two coal-fired power plants (the Craig and Hayden Stations) located along the Yampa River and none within the White River watershed. This adds evidence to the assumption that local coal combustion from these power plants does not appear to constitute the primary source of mercury contamination in these watersheds.

Despite the chronic, low-level harmful effects of mercury that Colorado pikeminnow are likely experiencing, we believe the population decline seen in Colorado pikeminnow populations within the Yampa and White Rivers over the past decade or more is primarily a result of increased nonnative species in these rivers, especially northern pike and smallmouth bass. As explained in the baseline section above, these nonnative fish populations have increased and have applied increasing pressure on the Colorado pikeminnow population. Coal emissions from the Craig and Hayden Stations have been largely constant since they became fully operational in the 1970s. The more recent decline of Colorado pikeminnow numbers in the action area coincides more closely with the expansion of nonnative fish, rather than any increase in mercury in the action area.

In addition, as discussed in the Baseline section above, the decline in Colorado pikeminnow numbers within the Yampa River has been more dramatic than the decline seen within the White River. This contrasts with the fact that mercury concentration measurements have been lower in Colorado pikeminnow taken from the Yampa River than from the White River.

While some Colorado pikeminnow individuals are likely to be experiencing low-level harmful effects from mercury in the system, we do not believe that the additional amount of mercury from the project will be enough to significantly or measurably reduce population numbers, reproduction, or constrain Colorado pikeminnow distribution.

4.3.3.2 Razorback sucker

The effects to the razorback sucker from project-generated mercury are similar to those described for the Colorado pikeminnow above, although likely to be less severe in the action area. The razorback sucker is not a piscivorous fish and would not bioaccumulate mercury as rapidly. Additionally, the razorback sucker does not occur as far upstream in the Yampa and White Rivers as the Colorado pikeminnow; thus, it does not occur as close to the point-sources for mercury resulting from the project. As with the Colorado pikeminnow, we believe nonnative species are the primary limiting factor for razorback sucker numbers, successful recruitment, and their distribution within the action area. While the evidence indicates that some razorback sucker individuals are likely being adversely affected by mercury in the system, we do not see evidence indicating that the negative effects from mercury rise to the level of reducing population numbers, are limiting reproduction, or are constraining razorback sucker distribution.

4.3.3.3 Humpback chub

The effects to the humpback chub in the action area from project-generated mercury are similar to those described for the Colorado pikeminnow above, although perhaps less severe. The humpback chub is not a top predator and may not bioaccumulate mercury as rapidly. Additionally, the humpback chub does not occur as far upstream in the Yampa River as the Colorado pikeminnow, and is not known to occupy the White River in any significant way; thus, it does not occur as close to the point-sources for mercury resulting from the project. As with the Colorado pikeminnow, we believe nonnative species are the primary limiting factor for humpback chub numbers, successful recruitment, and their distribution within the action area. While the evidence indicates that some humpback chub individuals are likely being adversely affected by mercury in the system, we do not see evidence indicating that the negative effects from mercury rise to the level of reducing population numbers, are limiting reproduction, or are constraining humpback chub distribution.

4.3.3.4 Bonytail

The effects to the bonytail in the action area from project-generated mercury are similar to those described for the Colorado pikeminnow above, although perhaps less severe. The bonytail is not a top predator and may not bioaccumulate mercury as rapidly. Additionally, the bonytail does not occur as far upstream in the Yampa River as the Colorado pikeminnow, and has only recently been stocked into the lower White River; thus, it does not occur as close to the point-sources for mercury resulting from the project. As with the Colorado pikeminnow, we believe nonnative species are the primary limiting factor for bonytail numbers, successful recruitment, and their distribution within the action area. While the data presented above supports the reasonable assumption that some bonytail individuals are likely being adversely affected by mercury in the system, we do not see evidence indicating that the negative effects from mercury rise to the level of reducing population numbers, are limiting reproduction, or are constraining bonytail distribution.

4.3.2 Selenium

Selenium is required in the diet of fish at very low concentrations (0.1 μg/g) (Sharma and Singh 1984), but at higher concentrations it becomes toxic. The safe level of selenium concentration in water for protection of fish and wildlife is considered to be less than 2 ug/L, and chronically toxic levels are considered by some to be greater than 2.7 ug/L (Lemly 1993; Maier and Knight 1994). In Colorado, the chronic aquatic life standard for total selenium in water is 5 μg /L (=4.6 ug/L dissolved) (CDPHE 2012a). However, dietary selenium is the primary source for selenium in fish (Lemly 1993); selenium in water is less important than dietary exposure when determining the potential for chronic effects to a species (USEPA 1998).

Excess selenium in fish has 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 (Lemly 2002). Excess dietary selenium also causes elevated selenium concentrations to be deposited into developing eggs, particularly the yolk (Lemly 2002, Janz et al. 2010, 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.

Of the four Colorado River fish species, we expect that excess selenium would disproportionately affect the razorback sucker somewhat more than the other three species (Hamilton et al. 2002; Osmundson et al. 2010). As with all sucker species, the razorback sucker is a bottom feeder and more likely to ingest selenium that has adsorbed to river sediments. Simpson and Lusk (1999) and Osmundson and Lusk (2011) reported on the concentrations of selenium in muscle tissues collected from Colorado pikeminnow and razorback suckers from the San Juan River. They found higher concentrations in razorback sucker than in Colorado pikeminnow; however, the average difference was only modest (3.5 mg/kg in razorback suckers vs. 3.0 mg/kg in Colorado pikeminnow, dry weight).

As stated in the Baseline section, the Yampa River has not exceeded the aquatic chronic toxicity standard for selenium. Water selenium concentrations in the White River have always registered below the chronic standard. Neither river is listed as impaired in the 303(d) EPA Clean Water Act list.

4.3.2.1 Colorado pikeminnow

Despite low selenium concentrations in the Yampa and White Rivers, selenium was detected at high levels in Colorado pikeminnow tissue in the 1960s in the Yampa River. In the White River, the few Colorado pikeminnow that were tested in the 1980s showed that their selenium fish tissue levels indicated a minimal hazard. We do not know where current selenium fish tissue levels stand in Colorado pikeminnow in the Yampa or White Rivers, but given that water concentrations in these two rivers are generally below the chronic standard, we have no recent data indicating that there is immediate cause for alarm. This contrasts with the water selenium concentrations that have been measured within Colorado pikeminnow critical habitat along the Gunnison River, for example, where surface waters have often exceeded Colorado Water Quality Standards for selenium (CDPHE 2011).

As stated above, we believe nonnative species are the primary limiting factor for Colorado pikeminnow numbers, successful recruitment, and their distribution within the action area. While we do believe that further sampling and testing for selenium is warranted, we do not see any evidence indicating that potential effects from selenium rise to the level of reducing population numbers, are limiting reproduction, or are constraining Colorado pikeminnow distribution.

4.3.2.2 Razorback sucker

We have no data on past or current selenium fish tissue levels in razorback sucker in the Yampa or White Rivers. However, water selenium concentrations in these two rivers are generally below the chronic standard; we have no indication that there is immediate cause for alarm. This contrasts with the water selenium concentrations that have been measured within razorback sucker critical habitat along the Gunnison River, for example, where surface waters have often exceeded Colorado Water Quality Standards for selenium (CDPHE 2011).

As stated above, we believe nonnative species are the primary limiting factor for razorback sucker numbers, successful recruitment, and their distribution within the action area. While further sampling and testing for selenium is warranted, we do not see any evidence indicating that potential effects from selenium rise to the level of reducing population numbers, are limiting reproduction, or are constraining razorback sucker distribution.

4.3.2.3 Humpback chub

We have no data on past or current selenium fish tissue levels in humpback chub in the Yampa or White Rivers. However, water selenium concentrations in these two rivers are generally below the chronic standard. Very few humpback chub currently occupy the Yampa River and we have no data indicating that they occur in the White River. We have no data indicating that there is immediate cause for alarm, although further sampling and testing for selenium is warranted.

As stated above, we believe nonnative species are the primary limiting factor for humpback chub numbers, successful recruitment, and their distribution within the action area. While further sampling and testing for selenium is warranted, we do not see any evidence indicating that potential effects from selenium rise to the level of reducing population numbers, are limiting reproduction, or are constraining humpback chub distribution.

4.3.2.4 Bonytail

We have no data on past or current selenium fish tissue levels in bonytail in the Yampa or White Rivers. However, water selenium concentrations in these two rivers are generally below the chronic standard. Bonytail have only recently been stocked into the lower Yampa and White Rivers. We have no data indicating that there is immediate cause for alarm, although further sampling and testing for selenium is warranted.

As stated above, we believe nonnative species are the primary limiting factor for bonytail numbers, successful recruitment, and their distribution within the action area. While further sampling and testing for selenium is warranted, we do not see any evidence indicating that potential effects from selenium rise to the level of reducing population numbers, are limiting reproduction, or are constraining bonytail distribution.

4.5 Effects to Critical Habitat

In addition to impacts to individual Colorado River fish, impacts would also potentially occur to those species' designated critical habitats in the action area. The physical and biological features of critical habitat for all four endangered fish are identical and contain the following (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, can be out of balance due to introduced nonnative fish species.

4.5.1 Colorado pikeminnow

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 this species would have the potential to adversely impact its critical habitat. As stated in the Baseline section above, critical habitat for the Colorado pikeminnow occurs within the mercury deposition zone of analysis for this project. An increase in the amount of mercury in river water negatively impacts water quality. It is difficult to quantify the level of impact from the proposed actions to critical habitat given the lack of information on where much of the mercury in the analysis area originates from. However, if it assumed that only five percent of the mercury deposited into the analysis area is generated locally, the impact directly from the proposed action may be relatively small. Nevertheless, when added to the other regional and global sources of mercury being deposited into the action area and the mercury already within the system, additional mercury from the proposed action is likely to result in an adverse impact to critical habitat through a reduction in water quality.

Although likely in smaller quantities, mercury from mine discharge may contribute as well. Mine discharge occurs within the Milk Creek watershed, which contains the Colowyo Mine, and ultimately enters the Yampa River within Colorado pikeminnow critical habitat. Although mercury amounts entering Colorado pikeminnow critical habitat from Colowyo Mine discharge are likely to be relatively minor, they would contribute to total mercury in the Yampa River and further reduce water quality incrementally.

Although potentially smaller than mercury, impacts to critical habitat from selenium added to the system through coal combustion and mine discharge, together with selenium added to the system by other sources, may also result adverse impacts to critical habitat for the endangered fish. However, current water quality data from the Yampa and White Rivers indicate that selenium levels have not exceeded the chronic aquatic life standard, and are likely to have less of an impact on water quality in critical habitat than mercury.

The Yampa and White Rivers are not currently listed as impaired for either mercury or selenium on the EPA 303(d) list (CDPHE 20102b). However, mercury concentrations have not been tested as recently as selenium and have exceeded the chronic aquatic life standard at given water quality monitoring stations along both the Yampa and White Rivers in the past.

Considering together the contributions of mercury and selenium from the project to the Yampa and White Rivers in the context of existing water quality data, the weight of evidence indicates that Colorado pikeminnow critical habitat would be adversely affected through a reduction in water quality, but is not and would not be compromised to a point that it no longer provides water of sufficient quality essential for the conservation of the species.

As discussed in the Status of the Species and Baseline sections above, endangered fish physical habitat (e.g., dams, diversions) and the biological environment (e.g., nonnative species) are currently experiencing the most severe impacts, which are unrelated to the project.

4.5.2 Razorback sucker

Razorback sucker critical habitat would be affected in a similar way by the project that Colorado pikeminnow critical habitat would be, as described above, but we expect the impacts to be of a lesser magnitude. Razorback sucker critical habitat does not extend as far up the Yampa or White Rivers and is, therefore, further from the point sources of Colowyo Mine discharge and emissions from the Craig Generating Station. Razorback sucker critical habitat is located downstream from, but not within, the mercury deposition airshed analyzed for this consultation. Colowyo Mine discharge also enters the Yampa River above, but not directly into, razorback sucker critical habitat. Mercury and selenium contributions to the action area from the project diminish with distance from these two point sources. This increases our confidence that the project would not diminish water quality to a point where critical habitat can no longer provide the physical and biological features essential for the conservation of the species.

4.5.3 Humpback chub and bonytail

Critical habitat for the humpback chub and bonytail are identical in the action area. Their critical habitats would be affected in a similar way by the project that Colorado pikeminnow critical habitat would be, as described above, but we expect the impacts to be of a lesser magnitude. No critical habitat has been designated for the humpback chub or bonytail along the White River. Humpback chub and bonytail critical habitat does not extend as far up the Yampa River as Colorado pikeminnow or razorback sucker critical habitats and is, therefore, further from the point sources of Colowyo Mine discharge and emissions from the Craig Generating Station. Humpback chub and bonytail critical habitat is located downstream from, but not within, the mercury deposition airshed analyzed for this consultation. Colowyo Mine discharge also enters the Yampa River above, but not directly into, humpback chub and bonytail critical habitat. Mercury and selenium contributions to the action area diminish with distance from these two point sources. This increases our confidence that the project would not diminish water quality to a point where these critical habitats can no longer provide the physical and biological features essential for the conservation of the species.

4.6 Cumulative Effects

The implementing regulations for section 7 define cumulative effects as "...*those effects of future State, or private activities, not involving Federal activities that are reasonably certain to occur within the action area of the Federal action subject to consultation.*" 50 CFR § 402.02

Within the action area, two coal fired power plants exist, the Craig Generating Station and the Hayden Generating Station, located approximately 4 miles east of Hayden, Colorado and 21 miles east of the Craig Generating Station. According to the BA, in 2013, the last year data is available, the Craig and Hayden Generating Stations emitted 42.4 lbs and 16.5 lbs of mercury, respectively for a total of total of 58.9 lbs. The Hayden Generating station emits less than half the amount of the Craig Generating Station, and is 21 miles further from habitats occupied by endangered fish in the Yampa River, but is also within the airshed analyzed for effects in this consultation, and therefore in the action area. The effects from all non-federal coal combusted at both of these two power plants, which is expected to continue (i.e., reasonably certain to occur), are considered to be cumulative effects.

As explained above, according to the EPRI (2014) modelling effort, the majority of mercury depositions (95 percent) within the greater area surrounding a power plant are from regional and global sources. Mercury deposition from *non-federal* actions generated outside of the action area are considered part of the cumulative effects. Thus, the bulk of the mercury that will be deposited in the action area in the future will come from regional and global non-federal actions (e.g., coal-fired power plants in Asia). These regional and global mercury sources have been depositing and will continue to deposit mercury within the action area. We assume that these inputs will continue at roughly the same deposition rate the action area has experienced in the past. We have no information about any increase or decrease of coal-fired power plants globally, or of the increasing use of pollution control measures that would work to reduce mercury emissions.

Therefore, we assume mercury inputs into the action area will be consistent with those of the last many years. These inputs have contributed to the current state of the action area regarding mercury. We assume these inputs will continue and current mercury levels will be maintained within the action area through future emissions, as described in the Baseline section above. The effects to the endangered fish and their critical habitats from mercury within the action area are described in the Effects of the Action above. We are not assuming an increase or decrease in mercury inputs or outputs to the action area, and thus, do not expect a worsening of the condition of the endangered fish or their critical habitats from mercury contamination. Instead we expect a continuation of the status quo—chronic, sub-lethal insults to the most sensitive individuals, which does not rise to the level of a large and detectable decrease in numbers, reproduction, or distribution.

4.7 Jeopardy discussion and Conclusion

After reviewing the current status of the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the project, as described in this biological opinion, is not likely to jeopardize the continued existence of the four endangered fish. We have reached this conclusion based on the following reasons:

- Of the four endangered fish, mercury concentrations in fish tissue have only been recorded in the Colorado pikeminnow, which is the species most likely to bioaccumulate mercury because it is at the top of the food chain and very long-lived. Mercury concentrations in many Colorado pikeminnow within the action area have been somewhat elevated in the past and indicate that the species is likely to be experiencing negative, sub-lethal impacts from mercury that are not insignificant. We do not have evidence, however, that mercury in the action area, in general, or the mercury released by project activities, in particular, is causing population level effects for any of the endangered fish species.

- To the extent a degraded baseline condition exists for the endangered fish because of mercury contamination, we believe the proposed action does not contribute to the deepening of such degradation in a significant way. The baseline condition is not degraded by mercury to an extent that the likelihood of recovery would be reduced appreciably solely due to the additional amount of mercury that will result from the action.

- Although fish tissue selenium concentrations have not been measured in all four of the endangered fish (Colorado pikeminnow only), the most recent fish tissue concentrations indicated a minimal risk to fish health.

- None of the four endangered fish species are meeting recovery targets within the Green River subbasin, which includes the Yampa and White Rivers in the action area. However, we believe this is primarily a result of nonnative species that have increased in the action area and large-scale habitat alteration (e.g., dams and diversions). These impacts are not increased as a result of the proposed action.

4.8 Destruction and Adverse Modification Discussion and Conclusion

After reviewing the current status of the critical habitats for the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail, the environmental baseline for critical habitats within the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the project is not likely to destroy or adversely modify any of the critical habitats designated for the four endangered fish. We have reached this conclusion based on the following reasons regarding water quality:

- Despite a few elevated mercury concentrations in the water, most reported values in both the White and Yampa Rivers, which includes all critical habitats in the action area, have been below the detection limit. Neither the Yampa River nor the White River is on the 303(d) list of impaired waters for mercury. If the project is approved, current project activities would continue. Given this, we do not expect mercury water concentrations to increase from project activities if approved.

- Water selenium concentrations in the Yampa and White Rivers, which includes all critical habitats in the action area, have not exceeded the chronic aquatic life standard in the past, according to the best available data. Neither the Yampa River nor the White River is on the 303(d) list of impaired waters for selenium. If the project is approved, current project activities would continue. We do not expect water selenium concentrations to increase from project activities if approved.

5.0 INCIDENTAL TAKE STATEMENT

Section 9 of the Act, as amended, and federal regulations prohibit the take of endangered and threatened species, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service as an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. Under the terms of section 7(b)(4) and section 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be a prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

As the Service explained in the effects section, there were many challenges to describing specific effects to individuals of the four endangered fish. Anticipation and exemption of incidental take is at the scale of the individual of a species and must be reasonably certain to occur (CFR 50 402.14(g)(7)). This requires that the Service build a reasonable basis to conclude that individuals of the four endangered fish will be subjected to adverse effects that in turn are reasonably certain to result in actual injury or death. In this biological opinion we are unable, based on the best available information, to find circumstances that support such a conclusion. Without specific information on the potential range of effects to individuals, we are also unable to develop a surrogate for the potential take of the four endangered fish. Therefore, no take is anticipated or exempted by this incidental take statement.

We were, however, able to explain that the broad range of potential adverse effects to the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail in the action area would not be likely to result in jeopardy to any of these species or destruction or adverse modification to their critical habitats. This finding satisfies Congress' direction in 7(a)(2) of the Act that "*Each Federal agency ...insure that any action ...is not likely to jeopardize the continued existence of any endangered species or threatened species, or result in destruction or adverse modification of habitat...determined by the Secretary... to be critical.*"

We also explained that OSMRE committed to a study examining the potential effects in more specific detail and it may increase our knowledge regarding specific effects to individuals. This may reveal whether (and to what extent), and how many individuals (if any) will be actually injured or killed.

Monitoring and Reporting

OSMRE shall monitor the progress of the proposed action (including implementation of the conservation measures) and report that progress to the Service on an annual basis. The report shall be sent to the Western Colorado Ecological Services office by no later than March 31st. This information can also be used by OSMRE to identify any potential need to reinitiate consultation on this action (see reinitiation triggers below).

6.0 CONSERVATION RECOMMENDATIONS

1. As stated in the Effects of the Action section, water is tested for mercury in receiving waters both above and below the discharge points at the Colowyo Mine. However, the detection limit appears to be too high to precisely measure the small amount of mercury leaving the mine through discharges, if any. We recommend that OSMRE require more sensitive mercury testing be done surrounding both the active mine and the Collom expansion area to be able to accurately quantify the mercury being discharged from the mine.

2. Efforts are underway to measure mercury concentrations in the White and Yampa Rivers both in fish and in the water. Riparian and aquatic insects living in and along these rivers, which are eaten by endangered fish (e.g., humpback chub, bonytail) and yellow-billed cuckoos, are likely to also contain some level of mercury. Should funding become available, we recommend that mercury concentrations be measured in insects that serve as food sources for these threatened and endangered species (e.g., large terrestrial insects found in cottonwood galleries and common aquatic insects found within endangered fish critical habitat).

7.0 REINITIATION

This concludes formal consultation on OSMRE's proposed action involving the approval of a coal mining plan for the Collom expansion area at the Colowyo Mine and eventual combustion of the mined coal at the Craig Generating Station. As provided in 50 CFR §402.16, reinitiation of formal consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If the amount or extent of taking specified in the incidental take statement is exceeded; (b) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (c) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (d) If a new species is listed or critical habitat designated that may be affected by the identified action.

As part of our approach to analysis, we have had to make a series of assumptions. One of those assumptions involves the amount of mercury deposited within the action area from local combustion sources. Together with OSMRE we have assumed that only 5 percent of the mercury deposited in the action area comes from local sources (including the Craig and Hayden Generating Stations). If the applicant-committed mercury deposition study demonstrates this assumption to be substantially incorrect, reinitiation of this consultation may be necessary.

We have also assumed that the current levels of mercury and selenium in endangered fish tissue within the action area are similar to what has been measured in the past, as discussed in the Baseline and Effects of the Action sections above. A separate effort conducted by the USGS, funded in part through the Bureau of Land Management and the Trapper Mine, is planned that would shed new light on mercury and selenium concentrations in fish tissue in the action area (Service 2016). If the results of this or similar studies indicate that fish tissue concentrations are much higher than expected based on past sampling, reinitiation of this consultation may be necessary. Other future studies may contribute information relevant to the effects of the action and this consultation.

If, during implementation of the proposed action, changes in circumstances, situation, or information regarding the proposed action occur, OSMRE should assess the changes and any potential impacts to listed species, review the re-initiation triggers above, coordinate with the Service, and make a determination as to whether re-initiation is necessary.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
764 Horizon Drive, Building B
Grand Junction, Colorado 81506-3946

IN REPLY REFER TO:
ES/GJ-6-CO-04-F-012-YP039
TAILS 06E24100-2013-F-0013

October 30, 2012

Memorandum

To: Natural Resource Specialist, Office of Surface Mining, Reclamation and Enforcement, Western Region Office, Denver, Colorado

From: Western Colorado Supervisor, Fish and Wildlife Service, Ecological Services, Grand Junction, Colorado Creed Clayton, Acting

Subject: Section 7 Consultation for the Collom Expansion of the Colowyo Mine owned by the Colowyo Coal Company, Colorado State Permit C-1981-019

The U.S. Fish and Wildlife Service (Service) received your September 4, 2012 request for formal section 7 consultation on September 10, 2012, regarding the Collom Expansion of the Colowyo Mine by the Colowyo Coal Company L.P. (Colowyo), Moffat County, Colorado. In accordance with Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et. seq.) (ESA) and the Interagency Cooperation Regulations (50 CFR 402), we transmit this correspondence to serve as the final biological opinion (BO) for the project.

Due to water depletions, the project would adversely affect the four endangered fish in the Upper Colorado River Basin and their critical habitats: Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), and bonytail (*Gila elegans*). You determined in your consultation request letter than the humpback chub and razorback sucker would not be affected by the proposed project. However, all four endangered fish and/or their critical habitats are found in the Yampa River system, downstream from the project site. Project-related depletions would adversely affect all four of these endangered fish species. The project would also impact the greater sage-grouse (*Centrocercus urophasianus*), a Federal candidate species for listing under the ESA.

The coal mine is approximately 28 miles south of the town of Craig, Colorado on state, private, and Bureau of Land Management (BLM) lands. Colowyo is proposing to expand the current permit boundary to incorporate the Collom Area (16,833 acres), for a total permit area of 29,084 acres. The proposed surface mining area within the permit revision would include a total disturbed area of approximately 2,244 acres. Accounting for noncontributory mine inflow, surface dust controls, and evaporative losses from drainage controls, Colowyo estimates that its average water depletions for the proposed action would be 36 acre-feet per year (af/yr) to the Yampa River. In 2007, Colowyo estimated that its mine operations were depleting approximately 527 af/yr, which were addressed in our section 7 consultation at that time (TAILS 2006-F-0178).

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 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.

On January 10, 2005, the Service issued a final programmatic biological opinion (PBO) on the *Management Plan for Endangered Fishes in the Yampa River Basin* (this document is available at http://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/yampa-river-pbo.html). The Service 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 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 af/yr. The FY2013 fee is $19.82 per acre-foot and is adjusted each year for inflation.

3. Reinitiation stipulations will be included in all individual consultations under the umbrella of this programmatic.

4. The Service and project proponents will request that discretionary Federal control be retained for all consultations under this programmatic.

The Recovery Agreement was finalized by the Service and the Water User on March 3, 2007 (in conjunction with the previous section 7 consultation for the mine). Because this project would deplete less than 100 af/yr, no recovery fees are necessary. The Office of Surface Mining has previously agreed to condition its approval documents to retain jurisdiction should section 7 consultation need to be reinitiated. Therefore, the Service concludes that the subject project 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.

The reinitiation criteria for the Yampa River PBO apply to all projects under the umbrella of the PBO. For your information the reinitiation notice from the Yampa River PBO is presented below.

REINITIATION NOTICE

This concludes formal consultation on the subject action. The Recovery Action Plan is an adaptive management plan because additional information, changing priorities, and the development of the States' entitlement may require modification of the Recovery Action Plan. Therefore, the Recovery Action Plan is reviewed annually and updated and changed when necessary and the required time frames include changes in timing approved by means of the normal procedures of the Recovery Program, as explained in the description of the proposed action. Every 2 years, for the life of the Recovery Program, the Service and Recovery Program will review implementation of the Recovery Action Plan actions that are included in this BO to determine timely compliance with applicable schedules. As provided in 50 CFR section 402.16, reinitiation of formal consultation is required for new projects where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and under the following conditions:

1. The amount or extent of take specified in the incidental take statement for this opinion is exceeded. The implementation of the Recovery actions contained in this opinion will further decrease the likelihood of take caused by water depletion impacts.

2. New information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion. In preparing this opinion, the Service describes the positive and negative effects of the action it anticipates and considered in the section of the opinion entitled "EFFECTS OF THE ACTION." New information would include, but is not limited to, not achieving one or more response criteria that will be developed as part of the terms and conditions to minimize incidental take. The Service retains the authority to determine whether a significant decline in population has occurred, but will consult with the Recovery Program's Biology Committee prior to making its determination. In the event that one or more population criteria have not been achieved, the Service is to first rely on the Recovery Program to take timely actions to correct the deficiency.

3. The section 7 regulations (50 CFR 402.16 (c)) state that reinitiation of consultation is required if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the BO. It would be considered a change in the action subject to consultation if the Recovery Action Plan items listed as part of the proposed action (Green River Action Plan: Yampa and Little Snake rivers) in this opinion are not implemented within the required timeframes. Also, the analysis for this BO assumed implementation of the Green River Mainstem Action Plan of the RIPRAP because the Colorado pikeminnow and razorback sucker that occur in the Yampa River use the Green River and are considered one population. The essential elements of the Green River Plan are as follows: 1) provide and protect

instream flows; 2) restore floodplain habitat; 3) reduce impacts of nonnative fishes; 4) augment or restore populations; and 5) monitor populations and conduct research to support recovery actions. The analysis for the non-jeopardy determination of the Yampa Plan that includes about 53,000 af/yr of new water depletions from the Yampa River Basin relies on the Recovery Program to provide and protect flows on the Green River. Specifically, the analysis for this BO assumed operation of Flaming Gorge Dam to meet the flow recommendations according to the upcoming Record of Decision on the Flaming Gorge Dam Operations environmental impact statement (EIS)[1].

The Service recognizes that the RIPRAP is an adaptive management plan that is modified according to additional information and changing priorities. The plan is reviewed annually and updated when necessary. The required timeframes include changes in timing approved by means of normal procedures of the Recovery Program. In 2006, and every 2 years thereafter, for the life of the Recovery Program, the Service and the Recovery Program will review implementation of the RIPRAP actions to determine timely compliance with applicable schedules.

Also, the analysis for this BO assumed impacts to peak flows based on anticipated future uses of water, if water is used in a substantially different timing regime that adversely affects endangered fishes in a way not considered in this opinion, then reinitiation of consultation is required. The Recovery Program will monitor all new water projects that deplete more than 100 af/yr to determine their impacts to peak flows on the Yampa River. In addition, the Recovery Program will monitor projects individually depleting 100 af/yr or less in cumulative increments of 3,000 af/yr to determine their impacts to peak flows.

4. The Service lists new species or designates new or additional critical habitat, where the level or pattern of depletions covered under this opinion may have an adverse impact on the newly listed species or habitat. If the species or habitat may be adversely affected by depletions, the Service will reinitiate consultation on the PBO as required by its section 7 regulations. The Service will first determine whether the Recovery Program can avoid such impact or can be amended to avoid the likelihood of jeopardy and/or adverse modification of critical habitat for such depletion impacts. If the Recovery Program can avoid the likelihood of jeopardy and/or adverse modification of critical habitat no additional recovery actions for individual projects would be required, if the avoidance actions are included in the Recovery Action Plan. If the Recovery Program is not likely to avoid the likelihood of jeopardy and/or adverse modification of critical habitat then the Service will reinitiate consultation and develop reasonable and prudent alternatives.

If the annual assessment indicates that either the recovery actions specified in this opinion have not been completed or that the status of all four fish species has not sufficiently improved, the Service intends to reinitiate consultation on the Yampa Plan to specify additional measures to be taken by the Recovery Program to avoid the likelihood of jeopardy and/or adverse modification of critical habitat for depletions. If other measures are determined by the Service or the Recovery Program to be needed for recovery prior to the review, they can be added to the Recovery Action Plan according to standard procedures, outlined in that plan. If the Recovery

[1] That decision has not been made as of the date of this letter.

Program is unable to complete those actions which the Service has determined to be required, consultation on projects with a Federal nexus may be reinitiated in accordance with ESA regulations and this opinion's reinitiation requirements. The Service may also reinitiate consultation on the Recovery Program if fish populations do not improve according to the population response criteria to be developed within one year of the issuance of this BO. Failure to maintain a positive response, whenever achieved, will be considered a negative response and subject to reinitiation.

If the Service reinitiates consultation, it will first provide information on the status of the species and recommendations for improving population numbers to the Recovery Program. Only if the Recovery Program does not implement recovery actions to improve the status of the species, will the Service reinitiate consultation with individual projects. The Service intends to reinitiate consultations simultaneously on all depletions.

All individual consultations conducted under this programmatic opinion will contain language requesting the applicable Federal agency to retain sufficient authority to reinitiate consultation should reinitiation become necessary. The recovery agreements to be signed by non-Federal entities who rely on the Recovery Program to avoid the likelihood of jeopardy and/or adverse modification of critical habitat for depletion impacts related to their projects will provide that such non-Federal entities also must request the Federal agency to retain such authority. Non-Federal entities will agree by means of recovery agreements to participate during reinitiated consultations in finding solutions to the problem which triggered the reinitiation of consultation.

Conservation Recommendations

As stated in our February 22, 2011 letter to Colowyo regarding their Coal Mine Permit Revision (PR-03) application (TAILS 2011-SL-0042), we believe every effort should be made to mitigate the expected loss of important habitats for the greater sage-grouse. It appears that most, if not all, of the Collom Expansion area is within Preliminary Priority Habitat (PPH), recently designated by the Colorado Parks and Wildlife (CPW) department for the greater sage-grouse (available at http://wildlife.state.co.us/SiteCollectionDocuments/DOW/WildlifeSpecies/GrSG_PPH_PGH_20120309_Final.pdf).

We recognize that Colowyo has proposed various measures to reduce overall impacts to grouse (and migratory birds), including the following:

1. A 212-acre reduction in the disturbance footprint.
2. A focused effort to reestablish sagebrush on slopes of < 10 percent (post mine topography)
3. The conversion of 274 acres of wheat fields to a conservation reserve program (CRP) equivalent plant community that would act as additional habitat for sage grouse, mule deer (*Odocoileus hemionus*), and elk (*Cervus canadensis*)

5

4. The avoidance of direct disturbance to all sage-grouse (and sharp-trailed grouse) leks;

5. And the potential revision of grazing management in the area that would benefit local grouse.

We support the full implementation of these conservation measures. Additionally, we recommend the marking of all wire fencing in areas of high grouse use in the permit area to reduce grouse collisions with fences during flight. CPW has conducted intensive grouse tracking efforts in the Axial Basin area and should be further consulted in this effort.

If any additional species that are Federally listed, proposed for Federal listing, or candidate for Federal listing are found in the project area, if critical habitat is designated in the project area, or if new information becomes available that reveals that the action may impact such species in a manner or to an extent that was not previously considered, this office should be contacted to determine if further section 7 consultation will be required. If the Service can be of further assistance, please contact Creed Clayton in our Grand Junction office at (970) 243-2778, extension 28.

cc: FWS/UCREFRP, Denver

CClayton:OSMColowyoCoalMineCollomExpansionBOY039.docx:103012:KM

Appendix D

Cultural Resource Protection Plan

Introduction

The Cultural Resource Protection Plan below has been taken verbatim from the approved PAP for PR 03. This CDRMS approved plan applies directly to the Proposed Action. The plan is also incorporated into Alternative B but will be modified as necessary to accommodate design components of Alternative B that differ from those of the Proposed Action. The plan can be modified as necessary over time at direction of the agencies or with approval of the agencies as on the ground conditions encountered or other relevant factors may differ from those originally anticipated.

The following plan is excerpted directly from: Colowyo Coal Company, SMCRA Permit C-1981-019, Application for Permit Renewal/Permit Revision, Volume 16, Exhibit 5, Item 3 and Permit Revision – 03, Approved by CDRMS 05/29/2013

Cultural Resource Protection Plan for the Collom Mine Expansion

Colowyo will avoid and protect cultural resources previously determined to be eligible for listing on the National Register of Historic Places (NRHP) and those needing additional work ("need data") within the permitted area. Should disturbance to a NRHP eligible or "need data" site be determined unavoidable, Colowyo will take the necessary steps to mitigate disturbance of the site and will inform the Colorado Division of Reclamation Mining and Safety (Division) and the Office of Surface Mining (OSM) of the measures it intends to take. OSM will contact the Colorado State Historic and Preservation Officer (SHPO) for all sites as well as the Bureau of Land Management (BLM) for sites located on federally managed lands to develop resource specific treatment plan(s). Colowyo through its cultural resources contractor (TRC Mariah Associates) provided a "Historic Properties Treatment Plan for Four Sites within the Proposed Colowyo Collom Mine Expansion Project, Moffat County, Colorado" in its permit application to the Division. While this plan has not been formally reviewed, it may serve as a starting point for treating these and other eligible sites should they be threatened by mining impacts.

Discovery Notifications

If a previously unidentified cultural resource is discovered in the permit area, Colowyo will take measures to protect the cultural resource, and provide written notice to Division and the OSM within 48 hours. A Colorado-permitted archaeologist meeting the Secretary of the Interior's Professional Qualifications Standards will, as soon as possible, evaluate the discovery, make a recommendation as to NRHP eligibility of the resource, and provide written notice to the Division and the OSM within 48 hours. The Division and OSM shall 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 (TCP), the Tribes with an interest will be notified and consulted with as appropriate. When agreement is reached between all parties involved, the appropriate mitigation measures, if necessary, will be implemented. The tribes, OSM, Division, SHPO and the surface landowner must agree to the treatment measures.

Discovery of Human Remains
If human remains are exposed during mining activities, these activities will be halted at once in the vicinity of the discovery. The remains will be covered over and stabilized, and access to the immediate area will be blocked by flagging and/or temporary fencing. Operations will cease for 100 feet in all directions around the site of discovery.

Unmarked burials located on private or state land will be treated under CRS 24-80-401 and CRS 24-80-1301. Colowyo will contact the County Sheriff, the County Coroner and the landowner to notify them of the discovery. The Coroner will 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 will contact the Office of the State Archaeologist (OSAC) at History Colorado. OSAC will then contact the landowner and the Colorado Commission of Indian Affairs (CCIA) to formulate a treatment plan within 10 days of the discovery. OSAC and CCIA will coordinate Native American Tribal notifications and subsequent consultations. Colowyo will 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) will apply in accordance with 43 CFR 10.

Cultural Resources Baseline Project Plan
Prior to commencing any ground-disturbing activities, Colowyo will engage a Colorado-permitted archaeologist to undertake a baseline assessment of all NRHP eligible and "need data" sites to document current conditions inside the permit boundary. This baseline assessment will include NRHP eligible sites 5MF4008, 5MF6089, and 5MF6128; and sites requiring additional work 5MF969, 5MF4003, 5MF4006, 5MF3996, 5MF1652, 5MF4010, 5MF5417, 5MF5418, 5MF5419, 5MF6116, 5MF6130, and 5MF6098.

During the baseline assessment an investigation will occur which will delineate high potential areas (HPA) for cultural resources within the permitted disturbance area. Once the HPA has been defined by the Colorado-permitted archaeologist, the HPA boundary will be provided to SHPO electronically for concurrence. The SHPO will have 15 business days to review, comment, and/ or concur with the HPA delineation. If after 15 business days, the SHPO does not respond to the request for comment, the HPA will be considered final. The area defined as the HPA will be the location in which subsequent culture resources monitoring will occur. Additionally, the drainage area between the Collom Sump and Little Collom Pond will be intensively resurveyed for cultural resources. The results of this initial baseline survey and the delineation of the HPA will be submitted to the Division. This baseline assessment will commence prior to ground disturbing activities; however, it may also be completed concurrently during initial ground disturbance. Appropriate Colorado Cultural Resource Survey Forms shall be completed for each resource.

HPA Monitoring

During the first three years of topsoil stripping, Colowyo will employ a Colorado-permitted archaeologist to monitor the removal of all late-Quaternary aged deposits in the HPA within the disturbance boundary. Should a site be encountered, stripping will cease for 100 feet around the site. Colowyo will promptly report the discovery and follow the procedures of the discovery clause presented above. If no sites are discovered during the first three years of topsoil stripping, the monitoring requirement will be relinquished within the HPA. If no discoveries are made during the annual topsoil stripping, no reporting will be required by Colowyo.

Topsoil stripping results of the monitoring will be included within the Year-4 monitoring report, as outlined below.

Duration

Upon completion of the baseline evaluation, Colowyo will follow up with field investigations every four years and monitor the sites listed above and other sites subsequently identified within the disturbance boundary. After three consecutive evaluations (12 years), should a no effect determination for impacts to these sites be determined through consultation with the Division, OSM, and SHPO, the requirement to monitor these sites will no longer be required. Colowyo will request in writing to discontinue monitoring from the Division, OSM, and SHPO. However, if project affects are identified, regular interval monitoring (every four years) will continue and be re-evaluated for continued monitoring every four years.

Reporting

The results from the field evaluations (initial baseline assessment and subsequent monitoring) will be compiled into detailed summary reports. The first report will include the baseline assessment and HPA delineation. This report will be completed and submitted to the Division as soon as practical, when the field evaluation is completed. Subsequent reports will include evaluations of impacts (as compared with) the original baseline assessment and will be submitted to the Division at the end of the construction season, but no later than December 31 of the year the monitoring occurred. Colowyo will not submit reports at the end of the construction season for topsoil stripping monitoring, because if a site is discovered, the unanticipated discovery notifications outlined above will have already occurred and will have been documented.

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Appendix E

Public Comments on the Draft EA and OSMRE/BLM Response

Table of Contents

List of Tables

1.0 Introduction

The Colowyo Coal Mine, Collom Permit Expansion Area Project Federal Mining Plan and Lease Modification Environmental Assessment (Collom Mine EA), OSRME's Unsigned Finding of No Significant Impact (FONSI), and BLM's Unsigned FONSI were released for public comment on January 19, 2016. The public comment period ran through February 18, 2016. Notice that the documents were planned for release, along with the release date, was published in the *Meeker Herald Times* on January 14, 2016 and in the *Craig Daily Press* on January 15, 2016. Once the documents were released, legal notice of availability was published in the *Meeker Herald Times* on January 21, 2016 and in the *Craig Daily Press* on January 22, 2016. Copies of the legal notice were also placed in several locations in Craig and Meeker. Copies of the EA were placed in the following public locations for public review:

- OSMRE, Western Region, 1999 Broadway, Suite 3320, Denver, CO 80202
- Colorado Division of Reclamation, Mining and Safety, 1313 Sherman St, Room 215, Denver, CO 80203
- Moffat County Building, 221 W. Victory Way, Suite 130, Craig, CO 81625
- Moffat County Library, 570 Green Street, Craig, CO 81625
- Bureau of Land Management, Little Snake Field Office, 455 Emerson Street, Craig, CO 81625
- Bureau of Land Management, White River Field Office, 220 East Market Street, Meeker, CO 81641
- Rio Blanco County Courthouse, 555 Main Street, Meeker, CO 81641
- Meeker Public Library, 409 Main Street, Meeker, CO 81641
- Rangely Public Library, 109 E. Main Street, Rangely, CO 81648

Approximately 50 Notice of Availability letters were sent directly to those who requested notification of the release of the Collom Mine EA during the public scoping period. Approximately 10 electronic CD copies of the EA and unsigned FONSIs were sent to adjacent landowners, nearby community leaders and other interested individuals.

2.0 Comment Analysis Process

Consistent with the National Environmental Policy Act (NEPA), 40 CFR 1503.4(b) and 43 CFR 46.305, responses included in this report address the substantive comments received during the public comment period on the Collom Mine EA and FONSIs. Each comment letter or email received was read by OSMRE and BLM to ensure that all substantive comments were identified. The comments were not weighted by organizational affiliation or status of respondents, and the number of duplicate comments did not bias the analysis. The process was not one of counting votes, and no effort was made to tabulate the exact number of people for or against any given aspect of the Collom Mine EA. Rather, emphasis was placed on the content of a comment. Conclusions on whether or not comments were considered substantive were based on the following definitions:

- Substantive comments include those that challenge, with reasonable basis, the information in the Collom Mine EA or the unsigned FONSIs as being inadequate or inaccurate; develop reasonable alternatives not considered by the agencies, or offer new specific information that may have a bearing on the decision.
- Non-substantive comments are those that do not pertain to the Project Area, Proposed Action or alternatives, or express opinions or position statements about the project or agency policy without accompanying factual basis or rationale to support the opinion.

All comments, substantive and non-substantive, and agency responses, are part of the Project Record for the Collom Mine EA, and have been considered during the decision-making process. The comment letters were reviewed, commenter data logged into a spreadsheet, and all information entered into the Project Record. The purpose of this appendix is to provide responses to substantive comments received on the Collom Mine EA, the OSMRE unsigned FONSI, and/or the BLM FONSI.

3.0 Comment Overview

Comments were accepted from the release of the preliminary Collom Mine EA on January 19, 2016 through February 18, 2016. A total of 9,761 comment letters and emails were received. If substantive comments were identified but did not require a change to the EA, the resource area or concern was noted and summarized in the response to comments presented below, which contains 28 summary comments and responses. Several comment letters contained corrections to the Collom Mine EA that required specific responses and changes to the document. Those comments with specific changes are presented in **Section 3.2**.

3.1 Summary Comments and Responses

This section paraphrases the substantive comments into Summary Comments and provides both general and specific responses. The following summary comments were identified after reviewing all of the comments.

3.1.1 Summary Comment 1: NEPA Process

Comment:
In order for the Secretary of the Department of the Interior to make an informed decision an Environmental Impact Statement (EIS) should be prepared for this proposal, not just an EA.

According to OSMRE's NEPA guidance (516 DM 13), the Project would meet the three criteria required to initiate an EIS: where "(a) the environmental impacts of the proposed mining operations are not adequately analyzed in an earlier environmental document covering the specific leases or mining activity," "(b) [t]he area to be mined is 1,280 acres or more, or the annual full production level is 5 million tons or more," and "(c) [m]ining and reclamation operations will occur for 15 years or more." 516 DM 13.4(A)(4). Also, earlier NEPA analysis relied upon by OSMRE, whether prepared by the BLM or by OSMRE, fails to adequately analyze and assess the impacts of the Craig Generating Station, both as a connected action and a reasonably foreseeable impact associated with approving mining at the Colowyo Coal Mine.

Response:

Alternative B, the alternative selected in the FONSI, does not meet the scenario described in the Departmental Manual 516 DM 13, which requires all three criteria to be met to initiate an EIS. With regard to criteria (a), in August 2006, BLM completed the EA for Lease-by-Application Collom Lease Tract COC-68590, the lease proposed to be mined under Alternative B, and issued a FONSI and Decision Record (DR) to offer the lands for lease. No appeals were filed challenging the adequacy of either the EA or DR. Therefore criteria (a) is not met. With regard to criteria (b), the actual area to be mined (Collom Lite Pit) would be 880 acres, 400 acres or about 32 percent less than the threshold criteria acreage of 1,280 acres. This part of the criteria (b) is not met. The annual maximum production rate for Alternative B is proposed at 5 million tons per year, which would meet the minimum full production rate part of criteria (b). Finally with regard to criteria (c), mining and reclamation operations under Alternative B would occur over 17 years, exceeding the criteria threshold of 15 years. However, because criteria (a) is not met, an EIS would not "normally" be required in accordance with the Departmental Manual.

Further, 516 DM 13 does not automatically mandate the preparation of an EIS if certain criteria are met. This guidance document only identifies major actions "normally requir[ing] the preparation of an EIS." 516 DM 13.4(A). It also explicitly recognizes that OSMRE may choose not to prepare an EIS for any of the listed actions. See 516 DM 13.4(A) "If for any of these actions it is proposed not to prepare an EIS, an EA will be prepared and handled in accordance with Section 1501.4(e)(2))". Thus, there is nothing in the Departmental Manual that diminishes OSMRE's discretion to follow the NEPA requirements in order to determine whether any particular action is significant.

OSMRE has completed an Environmental Assessment (EA) to determine if there would be significant effects as a result of approving the Colowyo Coal Mine Collom Permit Expansion Area Mining Plan Modification. Under the MLA and SMCRA, the Secretary, as delegated to the Assistant Secretary for Land and Minerals Management (ASLM), has the authority to approve, approve with conditions, or disapprove an application for a mining plan modification. As described in the EA Section 1.3.1, Statutory and Regulatory Background, OSMRE makes a recommendation to the ASLM on the decision for the mining plan modification. That recommendation is based on OSMRE's consideration of seven factors, one of which is compliance with NEPA (30 CFR 746.13).

In NEPA documents, significance is determined by context and intensity as defined by Council on Environmental Quality (CEQ) regulations at 40 CFR. The significance of the impacts to all resources is analyzed in the EA in Chapters 4 and 5, and the rationale for the conclusions reached is provided. For the reasons described in the FONSI, we have determined that there are no significant impacts for the selected alternative (Alternative B). Therefore, an EIS is not required under this pretext. OSMRE has not as yet submitted a recommendation to the ASLM on the decision.

3.1.2 Summary Comment 2: NEPA Process

Comment:
The EA should have looked at alternatives to burning coal for TriState. TriState territory contains excellent wind and solar resources and the costs of these resources are now very competitive.

Response:
NEPA requires federal agencies to disclose to the public the potential environmental impacts of projects they are considering authorizing. NEPA also requires agencies to consider and analyze reasonable alternatives to projects that are proposed. This EA analyzes the potential effects of approving both a federal coal lease modification and a surface mining plan modification. The EA fulfills the obligation of NEPA by analyzing and disclosing the potential effects of the proposed action.

Looking for alternative ways for Tri-State to generate energy is out of the scope of the project and beyond the jurisdiction of OSMRE/BLM.

3.1.3 Summary Comment 3: NEPA Process

Comment:
The EA should have analyzed TriState's coal costs for Craig Generating Station and whether they are really sustainable and the lowest cost way of generating electricity. Coal coming from the Colowyo Coal Mine is already being delivered at well above $2/MMBTU in most cases. When coal goes above $2/MMBTU there is good reason to believe that coal generation is no longer the lowest cost way of generating electricity and the EA should take a hard look at the alternatives to mining and burning coal. The media is full of stories on the cost competitive nature of wind and solar resources.

Response:
NEPA requires federal agencies to disclose to the public the potential environmental impacts of projects they authorize, and requires agencies to make a determination as to whether the analyzed actions would "significantly" impact the environment. The cost of generating electricity, and whether cheaper alternatives could possibly exist, is not relevant to environmental impacts. In addition, the media is not bound to report un-biased fact based data.

3.1.4 Summary Comment 4: NEPA Process

Comment:
The FONSI is not supported or justified.

Response:
The FONSI is supported by the data and analysis provided in the EA. There were no significant impacts identified in the EA; therefore, the FONSI was justified.

3.1.5 Summary Comment 5: NEPA Process

Under CEQ NEPA rules, an agency must analyze the impacts of "similar" and "cumulative" actions in the same NEPA document in order to adequately disclose impacts in an EIS or provide sufficient justification for a FONSI in an EA. See 40 C.F.R. §§ 1508.25(a)(2) and (3). The EA does not address the impacts of a number of similar and cumulative actions.

Response:
CEQ regulations at 40 CFR 1508.25 apply specifically to EISs and not EAs, as is the case here. BLM's NEPA Handbook, H-1790-1 states on page 44, Section 6.5.2 defining the Scope of the Proposed Action: "For an EA, we recommend that you consider connected or cumulative actions in the same EA, and similar actions may be discussed at your discretion." In Chapter 5 Cumulative Impacts, Section 5.2 Past and Present Actions, and Section 5.3 Reasonably Foreseeable Future Actions, OSMRE has analyzed the impacts of all applicable similar and cumulative actions in accordance with 40 CFR 1508.25 (a)(2) and (3), including other mining operations, grazing, oil and gas operations, etc. Four other active coal mining operations in northwest Colorado, as well as all other mining activities with 20 miles of the Colowyo Coal Mine, were analyzed. Any additional actions would be outside the scope of the Purpose and Need for this EA.

3.1.6 Summary Comment 6: Air and Climate Resources

Comment:
The Colowyo Coal Mine has the capacity to ship coal to other generating stations around the country. The EA assumes that all of the coal mined from the Collom area will be combusted at the Craig Generating Station; however, the Craig Generating Station does not combust, nor does it contract for, the maximum coal production for which the Project was analyzed. Therefore the emissions analysis in the EA over-predicts the amount of potential impact that the Project may have in the analysis area.

Response:
The analysis for indirect coal combustion emissions was calculated using the two regional generating stations because those are the only two facilities for which Colowyo coal has a transportation cost advantage, and as such they were determined to be reasonably foreseeable locations for the combustion. It was noted in the EA in Section 4.3.2.5 that Colowyo has historically sent coal to many other locations. However, since the Craig Generating Station

was the most consistent consumer of Colowyo coal, it was used as a reasonably foreseeable location of combustion. It was noted in the EA that the amount of combustion used for the analysis exceeded the amount currently contracted and historical averages.

3.1.7 Summary Comment 7: Air and Climate Resources

Comment:
In various places, the EA states OSMRE is making "conservative", "very conservative", or "highly conservative" assumptions. While OSMRE appropriately notes that many of the assumptions are "unrealistic" (EA page 5-9), there is an important distinction between "conservative" and "impossible." If one were to add up the total assumed emissions from coal under the Project, the concurrent Trapper Mine analysis, and other current sources of coal for the Craig and Hayden Generating Stations, one would produce significantly more total assumed emissions than are physically possible.

Response:
The use of the term conservative differed by context in the document so a single definition could not be introduced into the document. However, where additional context could be provided it was introduced. Further, the EA states at page 4-22 in a discussion of criteria emissions for Alternative A: "…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." In the next paragraph on that same page, the EA states: "... as stated above, the assumed 5.1 mtpy is a very conservative combustion rate and not representative of current rates at either generating station."

3.1.8 Summary Comment 8: Air and Climate Resources

Comment:
OSMRE inappropriately rejected analyzing and assessing the social cost of carbon (SCC) emissions that would result from its proposed mining approval. Just because the SCC analysis "can quickly rise to large values" doesn't mean that these external costs should not be very carefully documented and considered in the EA.

Response:
GHG emissions associated with the project are mostly from the indirect effects of coal combustion, and there is no consensus on the appropriate fraction of SCC tied to electricity generation that should be assigned to the coal producer. In addition, there is no certainty that GHG emissions at Craig Generating Station would actually be reduced if Colowyo Mine coal from the Project Area was not mined given that Craig Generating Station has alternative sources for coal. Also, in order to provide any meaningful insight, the projected SCC would need to be viewed in context with other Project costs and benefits associated with the Proposed Action. Given the uncertainties associated with assigning a specific and accurate SCC to the Project, and the uncertainties that indirect GHG emissions would actually be reduced under any reasonable Project alternatives, OSMRE has elected to quantify direct and indirect

GHG emissions and evaluated these emissions in the context of state and national GHG emission inventories.

As stated in the EA on page 4-26, Social Cost of Carbon: "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."

3.1.9 Summary Comment 9: Air and Climate Resources

Comment:
OSMRE's analysis perpetuates climate denial within the U.S. Department of the Interior. Although OSMRE acknowledges that its action will lead to the release of a substantial amount of GHG emissions, the agency claims that such impacts will not be significant, asserting that the emissions represent fractions of total statewide and nationwide greenhouse gas emissions.

Response:
Given that the impacts associated with GHG emissions are global or national in nature, the impact assessment associated with their emissions was contextualized on a state, national, and global scale for appropriate comparison and disclosure to the public of their relative impact. Further, the EPA confirms that individual sources of emissions cannot be modeled for their impacts to climate change (EPA 2008).

3.1.10 Summary Comment 10: Air and Climate Resources

Comment:
Under CEQ regulations, if the scope of the analysis is to be statewide or nationwide, then OSMRE is obligated to analyze and assess the impacts of all similar and cumulative actions. In the EA OSMRE only analyzed and assessed the GHG emissions that would result directly from the Colowyo Coal Mine and the reasonably foreseeable impacts of burning their coal that would be mined. Under NEPA, this limited and arbitrarily narrow scope of analysis does not serve to justify a FONSI.

Response:
OSMRE investigated the impact of direct, indirect, and cumulative actions in the context of statewide and national emissions to provide perspective for the reader. The scope of the EA analysis is appropriate for the Purpose and Need for the EA stated in Chapter 1, Section 1.3 (Purpose and Need), and therefore is appropriate for making a FONSI determination.

3.1.11 Summary Comment 11: Air and Climate Resources

Comment:

The U.S. Department of the Interior is currently weighing numerous coal decisions, similar to the proposed Project, that pose similar and cumulative impacts in terms of GHG emissions and climate impacts, particularly in terms of carbon costs. The EA does not adequately analyze cumulative impacts related to GHG and climate change.

Response:

In the EA Chapter 5 (Cumulative Impacts), Section 5.2 (Past and Present Actions), and Section 5.3 (Reasonably Foreseeable Future Actions), OSMRE has analyzed the impacts of all applicable similar and cumulative actions in accordance with 40 CFR 1508.25 (a)(2) and (3). Four other active coal mining operations in northwest Colorado, as well as all other mining activities with 20 miles of the Colowyo Coal Mine were analyzed. Further, on January 15, 2016 the Secretary of the Interior ordered the BLM to prepare a discretionary programmatic environmental impact statement (PEIS) that analyzes potential leasing and management reforms to the current coal program (Secretary of the Interior Order 3338). One of the major concerns that will be addressed in the PEIS is that of the coal industry on climate change.

3.1.12 Summary Comment 12: Air and Climate Resources

Comment:

Any earlier NEPA analysis relied upon by OSMRE, whether prepared by the BLM or by OSMRE, fails to adequately analyze and assess the impacts of the Craig Generating Station, both a connected action and a reasonably foreseeable impact associated with approving mining at the Colowyo Coal Mine. Similarly, any earlier NEPA analyses fail to adequately analyze and assess air quality impacts. Therefore, an EIS is required.

Response:

In August 2006, BLM completed the Environmental Assessment for Lease-by-Application Collom Lease Tract COC-68590 (CO-100-2005-036), to assist in a leasing decision proposed to be mined under both Alternative A and Alternative B, and issued a FONSI and Decision Record (DR) to offer the lands for lease. No appeals were filed challenging the adequacy of either the EA or DR and the opportunity to challenge the adequacy of that EA is past. The comment does not identify any specific new information that should be considered in this EA. Since criteria (a) of 516 DM 13.4(a)(4), and all three criteria must be met for an EIS to normally be prepared, an EIS would not normally be required for this proposed action. Further, 516 DM 13 does not automatically mandate the preparation of an EIS if certain criteria are met. This guidance document only identifies major actions "normally requir[ing] the preparation of an EIS." 516 DM 13.4(A). It also explicitly recognizes that OSMRE may choose not to prepare an EIS for any of the listed actions. See 516 DM 13.4(A) ("If for any of these actions it is proposed not to prepare an EIS, an EA will be prepared and handled in accordance with Section 1501.4(e)(2)). Thus, there is nothing in the Departmental Manual that diminishes OSMRE's discretion to follow the NEPA requirements in order to determine whether any particular action is significant.

OSMRE has completed this EA to determine if there would be significant effects as a result of approving the Project. The significance of the impacts to all resources is analyzed in the EA in Chapters 4 and 5, and the rationale for the conclusions reached is provided. For the reasons described in the FONSI, we have determined that there are no significant impacts for the selected alternative (Alternative B). Therefore, an EIS is not required.

3.1.13 Summary Comment 13: Air and Climate Resources

Comment:
Based on modeling prepared by WildEarth Guardians using the EPA's REMSAD model, mercury deposition from the Craig Generating Station is most significant near the power plant and affects the Yampa River. Within the Yampa River drainage, the Craig Generating Station contributes approximately 7.85 percent of all mercury deposition, with other coal-fired power plants in the region, as well as other sources, contributing as well. There would be impacts from mercury and selenium discharge from water outflows, as well as deposition of mercury and selenium from the combustion of coal at the Craig Generating Station.

Response:
Mercury deposition impacts have been assessed within the EA in Chapter 4, Section 4.3 (Air and Climate Resources), pages 4-28, 4-46, 4-52, 4-55, 4-70, 4-83, and 4-91; and in Chapter 5, pages 5-11 and 5-24. Further, the impact on the T&E species located in the Yampa watershed has been addressed in the USFWS BO (Appendix C) through the ESA Section 7 formal consultation process. The USFWS BO cover letter dated April 22, 2016 states: "the Service has prepared a BO with a finding that the proposed project is not likely to jeopardize the four endangered fish, nor is it likely to destroy or adversely modify their critical habitats (attached). We also concur (below) with OSMRE's determinations for the western yellow-billed cuckoo (cuckoo) and its proposed critical habitat." Additionally, USGS data shows that mercury levels in the Yampa River are below the detectable limit further demonstrating that mercury impacts are not significant. Lastly, mercury emissions from the Craig Generating Station are continuing to be reduced through the installation of new emissions controls, so the emissions impact over time is decreasing.

3.1.14 Summary Comment 14: Air and Climate Resources

Comment:
The EA does not contain any analysis or assessment of impacts to air quality. Instead, OSMRE defers to the permitting by the State of Colorado to assert that air quality impacts will not be significant. OSMRE cannot assert that Colorado is effectively addressing air pollution, yet also be moving to amend its own regulations to ensure that blasting is more effectively regulated. Here, there is simply no support for the agency's claim that air quality impacts will not be significant.

Response:
The EA includes a robust air quality analysis in Chapter 4, Section 4.3 (Air and Climate Resources), pages 4-7 through 4-51, and does not defer to CDPHE permitting. The analysis includes a hard look at direct and indirect emissions impacts, regional ambient air quality impacts, and dispersion modeling of direct emissions from the proposed mining operation.

3.1.15 Summary Comment 15: Air and Climate Resources

Comment:
HK Ranch is concerned that there are insufficient air quality monitoring requirements in the alternatives, including Alternative B, to ensure that HK Ranch is not significantly impacted by the mine expansion. Given the close proximity of HK Ranch to the mine site, certain impacts require further exploration to determine plans for preventing degradation in air quality, and to assure that potential identified adverse impacts are avoided. The conclusion that, "[t]he direct impacts on air and climate resources from a state and U.S. comparison are considered negligibly adverse" may not adequately address immediate local conditions, exposure to prevailing winds carrying particulate matter, hazardous air pollutants, and noxious substances. Furthermore, that conclusion relies upon statistical comparisons having little relationship to HK Ranch property.

Response:
The analysis presented in the EA concludes that significant air quality impacts would not occur to the HK Ranch. The air dispersion modeling was conducted using worst-case emission scenarios for Alternative B. This modeling suggests that all National Ambient Air Quality Standards would be protected outside the mine permit boundary. Additionally, PM_{10} is currently being monitored onsite. This data collection will continue throughout the life of the mine and is required as part of the mine's State Air Quality permit. Based on a review of the air quality data already collected at the mine, elevated particulate levels occur mainly during regional high wind event; as such additional monitors would not provide additional benefit.

Colowyo collects meteorological data from the North onsite meteorological station located at the following NAD 83 coordinates: 40o 16' 22.8" N, 107o 48' 36" W, elevation 7395 feet in the proximity of the existing mine offices. These North Station data were used as an input following validation by CDPHE modeling personnel. North Station data beginning in July 2008 to June 2011 and July 2012 to June 2013 were accepted by CDPHE and used in the analysis. A year-to-year data comparison showed consistency in the average wind speeds and directions and indicated that meteorological data was consistently collected. The use of onsite data adequately captures and incorporates localized meteorological conditions into the air dispersion model, which shows compliance with all applicable ambient air quality standards. In addition, the State of Colorado operates various air quality monitors throughout the State. The data from the monitors is evaluated on a routine basis, and will be a lead indicator to any degradation in air quality caused by the project.

3.1.16 Summary Comment 16: Air and Climate Resources

Comment:

There is also evidence that, during periods of exceptionally high winds, the PM_{10} standards have been exceeded, even though Colowyo had introduced a mitigation plan for prior violations (EA page 98-99, Table 3.3-5). Nevertheless, Colowyo has not produced complete records of levels of dust, particulate matter, and air pollutants the mine has caused in recent years.

HK Ranch requests required installation of a series of air quality monitoring devices along various agreed upon property lines separating the permitted mine area and HK Ranch, first to establish a baseline, and then to monitor any ongoing impact. Thereafter, regular and systematic readings of air quality monitoring should continue for as long as mining and reclamation operations continue. All air quality readings should be made available to HK Ranch representatives within an agreed upon period of time. If at any time the air quality readings reveal impermissible air pollutant levels, Alternative B must include all appropriate mitigation.

Response:

On-site PM_{10} monitoring has been disclosed both in the EA as well as in public CDPHE submissions. "Levels of dust" and particulate other than PM_{10} are not measured by Colowyo.

The State of Colorado operates various air quality monitors throughout the region. The data from the monitors is evaluated on a routine basis, and will be a lead indicator to any degradation in air quality caused by the project. Current onsite PM_{10} data will continue to be available to the public. These data can be acquired by contacting CDPHE and requesting the data. Colowyo may also be able to provide data.

3.1.17 Summary Comment 17: Financial Assurances

Comment:

The Colowyo mine is self-bonded and the guarantor is Tri-State Generation and Transmission. According to Tri-State's most recent financial reports, the company's total liabilities to net worth is more than a 2.5 ratio. Tri-State's current self-bonding obligations in Colorado and Wyoming is currently more than 10 percent of the company's net worth. Although this does not exceed the 25 percent threshold set forth under SMCRA rules, it raises concerns in light of the fact that the coal industry as a whole has been declining and faces significant financial troubles. Therefore, before OSMRE can approve the proposed mining plan, it must review whether bonding at Colowyo is adequate under SMCRA.

Response:

Determining compliance with the bonding provisions of SMCRA is outside the purpose and scope of the EA. Pursuant to 30 CFR 746.13, OSMRE's recommendation to the ALSM for a decision on the mining plan modification is based on a number of separate and distinct actions including but not limited to compliance with NEPA; the findings and recommendations of the BLM with respect to the resource recovery and protection plan; and the findings and recommendations of the regulatory authority with respect to the permit application and the state program. The OSMRE action of determining compliance with SMCRA and other requirements of federal laws, regulations and executive orders is distinguished at 30 CFR 746.13 from OSMRE's action to assure compliance with NEPA.

3.1.18 Summary Comment 18: Financial Assurances

Comment:

On February 8, 2016, WildEarth Guardians filed a citizen complaint with exhibits pursuant to the Surface Mining Control and Reclamation Act ("SMCRA"), 30 U.S.C. §§1267(h)(1) and 1271(a)(1), and regulations thereunder, 30 C.F.R. § 842.12(a), regarding Peabody Energy's self-bonding of its coal mining operations in Colorado, New Mexico, and Wyoming. In response, OSMRE requested clarification on certain pieces of information in Guardians' complaint and requested copies of exhibits. Furthermore, since that the filing of the complaint, new financial information has been released confirming that Peabody's financial status is such that the company certainly is not eligible for self-bonding.

Response:

This comment appears to only pertain to a separate complaint against Peabody Energy. Peabody Energy is not affiliated with Tri-State or Colowyo; the comment is not relevant, as written, to the Collom EA.

3.1.19 Summary Comment 19: Document Adequacy

Comment:

There are potentially critical documents upon which the EA places reliance which the public has not had an opportunity to review to date, e.g., the SMCRA Permit, the Stormwater Discharge Permit and the Stormwater Management Plan; the Erosion and Sedimentation Control Plan, and other documents referenced throughout the EA and the EA Appendices.

Response:

The documents referenced in the EA are available for review by the public from the applicable agencies, online (in some cases), or in the project record for this EA.

3.1.20 Summary Comment 20: Document Adequacy

Comment:

OSMRE and BLM must take into account an operator's compliance with their SMCRA permit when acting upon mining plan proposals.

Response:

Determining compliance with the SMCRA permit is outside the purpose and scope of the EA. Pursuant to 30 CFR 746.13, OSMRE's recommendation to the ASLM on a decision on the mining plan modification is based, at a minimum, upon:

- The permit application package;
- 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;
- 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 MMLA;
- Findings and recommendations of the 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.

Review and assurance of compliance with applicable requirements of federal laws and regulations other than NEPA is a separate action undertaken by OSMRE in making a recommendation to the ASLM.

3.1.21 Summary Comment 21: Wildlife

Comment:
Among the environmental protection performance standards established by SMCRA are those related to the protection of wildlife. The law requires both surface and underground coal mining operations "to the extent possible using the best technology currently available, minimize disturbances and adverse impacts of the operation on fish, wildlife, and related environmental values, and achieve enhancement of such resources where practicable." 30 U.S.C. §§ 1265(b)(24) and 1266(b)(11). The Project would violate these standards.

Response:
OSMRE, BLM, and CPW have determined that Alternative B does not significantly impact wildlife species and that disturbance has been minimized to the extent practical. A Fish and Wildlife Plan is required to be submitted to the State by a coal operator as a part of a SMCRA permit application by the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining (Rule 2.05.6, Mitigation of Impacts of Mining operations, (2) Fish and Wildlife Plan). That Plan states how the mining plan (or modification) will minimize disturbances and adverse impacts on fish and wildlife and related environmental values during surface coal mining and reclamation operations, and how enhancement of these resources will be achieved, where practicable. PR03 - as approved by CDRMS on May 29, 2013, - includes Colowyo's Fish and Wildlife Plan which is incorporated into and made a part of Colowyo's proposal for both Alternatives A and B and described in EA Section 2.3.16 (Project Design Features), and in greater detail in Appendices A and B of the EA. Additional project design features proposed to

reduce potential impacts on fish and wildlife and specifically applicable to Alternative B are described in Section 2.4.2, Reduced Mining Activity; Section 2.4.3, Greater Sage Grouse Protection Project Design Features; and Section 2.4.4, Other Mine Components and Associated Project Design Features.

3.1.22 Summary Comment 22: Special Status Species

Comment:
The EA appears to fail to analyze and assess impacts to endangered fish and their critical habitat in the Yampa River drainage and downstream, including the endangered razorback sucker and Colorado pikeminnow and their designated critical habitat. Recent reports indicate that mercury and selenium contamination are adversely affecting the Colorado pikeminnow and razorback sucker and their critical habitat in other rivers in the Colorado Plateau region and that contamination may be preventing the recovery of these species.

Response:
EA Sections 4.9.1.1 and 4.9.2.1 detail the anticipated impacts to the Colorado River Fish species and critical habitat and use information provided in the Biological Assessment sent to the USFWS. The USFWS BO issued 4/22/2016 for this project also provides an analysis of the potential impacts on Colorado River Fish. The USFWS BO cover letter dated April 22, 2016 states: "the Service has prepared a BO with a finding that the proposed project is not likely to jeopardize the four endangered fish, nor is it likely to destroy or adversely modify their critical habitats (attached). We also concur (below) with OSMRE's determinations for the western yellow-billed cuckoo (cuckoo) and its proposed critical habitat."

3.1.23 Summary Comment 23: Special Status Species

Comment:
OSMRE must consult with the U.S. Fish and Wildlife Service (USFWS) over mercury and selenium contamination impacts in accordance with Section 7 of the Endangered Species Act (ESA). The failure to do so not only violates NEPA, but also the ESA.

Response:
The EA Section 4.9.2.1, Threatened, Endangered and Candidate Species, page 4-80, states that formal consultation with the USFWS on potential impacts to the Colorado River fish from mercury and selenium has occurred. The USFWS concurred with the findings in the BA that impacts to the Colorado River Fish from mercury and selenium would adversely affect these species, but determined that these effects would not jeopardize their continued existence.

3.1.24 Summary Comment 24: Special Status Species

Comment:
The Project would expand into greater sage-grouse (GRSG) priority habitat management area (PHMA), in violation of SMCRA's requirement that the best technology currently available be

used to minimize disturbances and adverse impacts of the operation on fish, wildlife, and related environmental values. Although OSMRE has proposed to approve a land transfer, ultimately, this will result in less GRSG PHMA given that the Project will strip several thousand acres of habitat. The proposed approval contravenes SMCRA and cannot be approved

Response:
The BLM has indicated that the proposed design features in Alternative B described in Chapter 2 Proposed Action and Alternatives, Section 2.4 Alternative B - Reduced Mining Activity and Additional Greater Sage Grouse Protection, would meet the goals of BLM's 2015 Greater Sage Grouse RMP amendment. CPW has also indicated that the proposed design features and protections would be acceptable. Finally, the donation parcels total 4,540 acres of land that would be protected for GRSG habitat in perpetuity compared to the 2,133 acres of PHMA that would be impacted by mining operations. Upon completion of reclamation, more GRSG habitat will exist than existed prior to the mining activity.

3.1.25 Summary Comment 25: Water Resources

Comment:
Alternative B presents a significant exposure to erosion and sedimentation from surface water, snowpack, and stormwater runoff, particularly from the unusual event storm. With mining extending a minimum of an additional 15 years under Alternative B, the accompanying risk for an unusual event storm is exacerbated. The erosion and sedimentation could release trace heavy metals such as mercury and total suspended solids, resulting in bioaccumulation and soil accumulation which could threaten water quality, biota, and wetlands in neighboring water courses.

Response:
Alternative B includes numerous measures to protect downstream surface waters during both "normal" flows and less frequent high flows from intense thunderstorms or snow melt, including: engineered sediment ponds with restrictions on release of water; runoff, erosion, and sediment control structures (including berms, ditches, silt fences, etc.) to direct runoff away from disturbed areas where possible and to treat runoff that contacts disturbed areas; stream buffer zones; interim and final reclamation; and long-term water monitoring under both CDRMS and CDPHE oversight. CDRMS would conduct routine inspections to ensure that these measures are in place and functional; the CDPHE water discharge permit would include limitations on the amount of water that could be discharged and the quality of that water. Further, Alternative B includes a shorter life span for mining and ground disturbance farther away from the HK Ranch than Alternative A, which was the plan originally proposed by the proponent and which was already approved by CDRMS.

Also, note that the release of pollutants such as those listed in this comment is specifically controlled by the design features noted in the EA. Engineered water management features are designed to function well beyond the noted one-year storm event and CDRMS regulations ensure that the pollutant solids mentioned are not released off site. The conveyance of these pollutants in water would be regulated under the CDPHE water discharge permit, as well as other regulations, to protect the water quality, biota, and wetlands downstream of the mine.

3.1.26 Summary Comment 26: Water Resources

Comment:

Changes to the existing flow and quality of Little Collom Gulch will occur by building holding ponds to control erosion or downstream contamination which will be allowed to evaporate. This will reduce the flow of water into Collom Gulch and adversely affect downstream water users.

Response:

The detention of stormwater in sediment ponds is required by CDRMS regulations as a means of ensuring the protection of downstream waters from the types of water quality impacts mentioned in summary comment 25. The potential for some increased evaporation is thus a necessary trade off. However, Section 3.5.1 of the EA shows that Little Collom Gulch currently includes small stock ponds that retain runoff and appear to reduce flow in a downstream direction within the Project Area, causing Collom Gulch to be devoid of flow in parts of the year. However, infiltrated flows may reemerge further downstream, and water stored in the sediment ponds would potentially contribute to downstream flows in this manner. Further, CDRMS findings that included the Alternative A plan (see reference to this findings document in the EA) noted that "…no significant change in the hydrologic balance is likely to occur" and this would be likely to apply to Alternative B as well. Rule 4.05.18 in the CDRMS regulations states that "any person who conducts surface or underground mining activities shall replace the water supply of any owner of a vested water right which is proximately injured as a result of the mining activities in a manner consistent with applicable State law." This would apply to Colowyo in regard to its obligations to downstream water users.

3.1.27 Summary Comment 27: Water Resources

Comment:

High water and storm events are especially critical for the Little Collom Gulch drainage. During drought years heavy downpours frequently occur causing abnormal water flows, causing empty stock ponds to refill and as a result provides water to our livestock.

Any changes to historical drainage patterns require consideration of appropriate stormwater management tools after critical study. Water engineering consultants typically are reluctant to place reliance upon an unsupported assessment of "low runoff potential" when considering prophylactic measures in dealing with resulting flooding from a 100 year storm. Neither is it desirable to approve long distance diversions. Having ditches built which would divert water from Little Collom to Jubb Creek would reduce the downstream flow of water.

Response:

There is no plan to divert water from Little Collom Gulch to the Jubb Creek watershed, under either Alternative A or Alternative B. All water generated in the Collom watershed would remain within that watershed. Further, the proposed stormwater management tools have been subjected to critical study throughout the CDRMS mine permitting process. Designs for sediment pond dams and ditches must additionally be approved and stamped by licensed Professional Engineers and meet all additional regulations. The mine permit gives more detail on these requirements than is appropriate for this EA; the permit is available to view at the CDRMS offices, 1313 Sherman Street Denver, CO 80203, and on the CDRMS website at:

3.1.28 Summary Comment 28: Water Resources

Comment:

Alternative B includes that Colowyo will divert a significant amount of water for dust control and other purposes. While Alternative B generally suggests that Colowyo has water rights on those tributaries, it does not assess the impact on a downstream water rights owner along Little Collom Creek. Thus, the EA and FONSI do not sufficiently support the conclusion that downstream water rights will not be significantly impacted. For example, even if Colowyo owns a senior water right, which the EA does not identify, changing the site or nature of its use could have significant impacts on downstream users and could potentially violate Colorado law.

Response:

Rule 4.05.18 in the CDRMS regulations states that "any person who conducts surface or underground mining activities shall replace the water supply of any owner of a vested water right which is proximately injured as a result of the mining activities in a manner consistent with applicable State law." This would apply to Colowyo in regard to its obligations to downstream water users. Also note that Colowyo would abide by all applicable water rights regulations administered by the Colorado Division of Water Resources. Further, CDRMS findings that included the Alternative A plan (see reference to this findings document in the EA) noted that "…no significant change in the hydrologic balance is likely to occur" and this would be likely to apply to Alternative B as well.

3.2 Comments Resulting in Changes to the EA

Several comments necessitated changes or additions to the draft EA. These comments and changes are summarized below in **Table 3.2-1**.

Table 3.2-1 Summary Significant Changes to the EA

Comment	OSMRE/BLM Response	Changes to the EA
Page 1-5, Section 1.2, last paragraph. PR03 was permitted for a 19 year mine life with an overall life of 29 years including the bond liability period. Should consider revising this phrase.	The agencies agree that the change in the dates will clarify that the life of mining does not include the reclamation period.	**Page 1-5, Section 1.2, last paragraph** • The life of the project under Alternative A and B have been updated to 21 and 17 years, respectively.
Page 1-5, Section 1.2.1. The description of the Statutory and Regulatory Background should include some discussion about the Secretary's Order on Leasing of January 22, 2016. There is likely to be confusion among the public about the effect of the Order on the Proposed Action, and it would be useful to add a sentence or two explaining that OSMRE's mine plan review actions such as for this Project are expressly excluded from the leasing moratorium that is laid out in the January 22nd Order.	The agencies agree that additional language would aid in informing the public and dispel any confusion. Additional language has been inserted at the end of this section.	**Page 1-6, last paragraph** • Additional language has been inserted describing the Order.
Page 1-7, last paragraph under Section 1.3. Additional language was suggested to more fully describe the need of the project for Colowyo to meet their obligations under the Mineral Leasing Act	The agencies agree that additional language would further clarify the stated need of this project.	**Page 1-7, Last paragraph under Section 1.3** • An additional sentence was added in the last paragraph that describes Colowyo's obligations to provide coal.

Comment	OSMRE/BLM Response	Changes to the EA
Page 1-12, Section 1.4.2, Last three paragraphs in the page. This is correct, but should make clear that in addition to being a VER, Alternative B has been designed with site-specific information and the CPW has confirmed that Alternative B will not have a significant impact on sage grouse. These facts are well-explained elsewhere in the DEA, but the discussion here creates an impression that the only reason the Project can be approved consistent with ARMPA is by virtue of Colowyo's valid existing rights. Also, it should be stated here that Alternative B would also conform to the ARMPA and not be inconsistent with the requirements of the plan.	The agencies understand that additional language regarding compliance with the Northwest ARMPA would be helpful.	**Page 1-12, Section 1.4.2, last paragraphs on the page.** • Additional information has been added to the discussion of valid existing rights regarding the distance of the alternatives to a sage grouse lek and the overall compliance with the ARMPA.
Page 2-1, Section 2-2, first paragraph. Should add all lease numbers involved in the existing operations.	These leases were inadvertently left out. The agencies agree that they should be added in.	**Page 2-2, Section 2.2, top of the page** • Lease numbers COC-35874 and COC-29224 have been inserted.
Page 2-2, last sentence of the 1st paragraph. Colowyo reported to DRMS in the 2014 Annual Reclamation report that Colowyo currently has 1,583 acres of reclamation in varying states of progress. If you include the 2015 reclamation acres this would add another 77 acres for a total of 1660 acres. Based on the above comment the overall percentage currently reclaimed should be 44%.	A conversation between OSMRE, CDRMS, and Colowyo confirmed that the correct acreage reported to the State is 1,579.	**Page 2-2, last sentence of the first full paragraph.** • The acreage of total acreage disturbed and the acreage reclaimed has been updated with numbers reported to the State.

Comment	OSMRE/BLM Response	Changes to the EA
Page 2-6, Figure 2-2. The disturbance boundary on the southern end of the Collom Pit is incorrect based on what was approved for the disturbance boundary under PR03.	The agencies agree that a small portion of the boundary as described in the comment is incorrect.	**Page 2-6, Figure 2-2.** • The disturbance boundary has been edited on the map to depict what is shown in PR03.
Page 2-7, Section 2.3.2, 5th paragraph. Along with an auger, drilling may also use a blast hole drill.	The agencies agree that this information should be included.	**Page 2-7, Section 2.3.2, 5th paragraph** • Language regarding this method has been included.
Page 2-13, last paragraph of Section 2.3.8 The 10 year liability period is for Phase III release not Phase II as noted in the EA. Phase II release can occur at the earliest 4 years after the first seeding. Sediment control structures can be removed when the entire watershed contributing to them is Phase II released, and Phase II does not correspond to the 10-year requirement as noted in this paragraph.	The agencies agree with the point of the comment and updated the discussion of the Phase II and Phase III release dates.	**Page 2-13, last paragraph of Section 2.3.8** • The information has been updated with the new dates of when bond release would occur.
Page 2-13, Section 2.3.9. Jubb Creek is a tributary to Wilson Creek which is a tributary to Milk Creek. Good Springs Creek is a tributary to Milk Creek. The EA should be revised to state, "Several diversions on Good Springs Creek, which is a tributary to Milk Creek, are included in the rights controlled by Colowyo."	This information was verified and the agencies agree it should be updated.	**Page 2-13, Section 2.3.9,** • The suggested language has been incorporated into the section.
Page 2-22, Table 2.3-5. Include an additional stormwater permit number.	The agencies agree that this information was inadvertently left out.	**Page 2-21, Table 2.3-5.** • Additional permit number COR 040209 has been included.

Comment	OSMRE/BLM Response	Changes to the EA
Page 2-32, Section 2.4.4.1, First bullet. Should be updated to indicate that only the Wilson Creek crossing would use a bottomless culvert.	As this is what is included in PR04, the agencies agree that this should be updated.	**Page 2-30, Section 2.4.4.1, First bullet.** • This information has been included.
Page 2-33, Section 2.4.4.2 Power Line. Once the power line is constructed from the Axial Basin substation to the facilities area there is no intention to move the power line. The power line may be moved from the facilities area to other areas within the operation but these moves would be with in areas that are already disturbed and would not create additional disturbance. Suggest deleting this sentence. Other edits to this section.	OSMRE and Colowyo discussed this section in order to present the information more concisely as presented in PR04.	**Page 2-30 to 2-31, Section 2.4.4.2.** • This section has been re-written to present the information regarding the power line under Alternative B as presented in PR04. • Figure 2-3 has been updated with the location of the power line as described under PR04.
Page 2-38, Section 2.6.1. In addition to these reasons, it should be noted that the coal resource at Colowyo is characterized by a large number of relatively thin seams, spread over a fairly long vertical span. Under these conditions, surface mining achieves a substantially higher recovery of coal, and is therefore materially better at attaining the objectives of the Mineral Leasing Act and related regulations.	The agencies agree with the suggested text changes.	**Page 2-36, Second paragraph under Section 2.6.1.** • A new paragraph detailing how underground mining is not best suited to meeting the objectives under the MLA has been added.
Page 3-3, Section 3.2. Straight Gulch is located well outside of the project area and the approved SMCRA permit boundary, and should be removed from this discussion in the EA.	OSMRE agrees with this change.	**Page 3-3, Section 3.2.** • Straight Gulch has been removed from the discussion.

Comment	OSMRE/BLM Response	Changes to the EA
Page 3-4, Section 3.3.3, 1st paragraph These distances seem to be true but it seems like it may be appropriate to reference them to the Collom Pit.	The agencies agree to this change.	**Page 3-4, Section 3.3.3.** • The first paragraph has been updated with the new distances from the center of the Collom Lite pit.
Page 3-19, Section 3.3.7, 1st paragraph. This "Onsite Air Quality" section narrowly focuses on PM_{10} and stands in contrast to the regional air quality section that focuses on all of the major pollutants. It seems appropriate that there should be some acknowledgement that the local air quality for the other pollutants is good and there are no issues. It also seems that with this discussion of PM_{10} exceedances there should be a discussion of the fact that the Colowyo mine area and the Axial Basin at large is a large open area that is largely treeless and that the area regularly experiences high winds due to the open fetch of the land. The presentation of this information in the stand alone fashion it is presented in presents an out of context picture which gives the reader an incomplete picture of what is happening.	PM_{10} was only addressed in the "Onsite" section because that is the only pollutant that is actually being monitored. Also, it is the agencies' understanding that PM_{10} was the only pollutant that warranted monitor evaluation by the state. Further, explanation to include the Axial basin and treeless areas is acceptable.	**Page 3-19, Section 3.3.7, 1st paragraph.** • Information on PM_{10} was included because it is the only pollutant being monitored onsite. • Additional information on the Axial Basin has been included.
Page 3-26, Section 3.4.1, 3rd paragraph. In Chapter 2 it is stated there are nine minable coal seams for the project. Here it is broken down further. While both ways of stating the seams are correct, both Chapter 2 and 3 should be consistent on how the minable seams are portrayed.	The agencies agree that the information should be presented in the same way.	**Page 3-26, Section 3.4.1, 3rd paragraph.** • The text has been updated to read the same as what was presented in Chapter 2.

Comment	OSMRE/BLM Response	Changes to the EA
Page 3-28, Section 3.5.1, 5th paragraph. Figure 3-5 and Section 3.5.1. This figure and data provided for the surface water monitoring locations does not present an accurate representation of the approved surface monitoring program (PR-03) for Collom. Currently, Colowyo is required to monitor LLCG, LCG, UCG, CJC, and WFJC. Figure 3-5 also indicates that Colowyo is monitoring EFJC-97 and EFJC-04. Both of these locations were utilized for baseline surface water monitoring and not are part of the PR-03 approved surface water monitoring program for Collom. A note or revised text should be included that clearly defines this difference in monitoring, or the EA needs to be amended to include the approved surface water monitoring sites only.	The agencies agree that this information should be updated in this section and in Figure 3-5.	**Page 3-27, Section 3.5.1, 5th paragraph** • The text has been edited to indicate that some of the sites discussed and shown in the figure are currently monitored, while some were only monitored during the baseline data collection program. • A note has been added to Table 3.5-1 to clarify. • The legend on Figure 3-5 has been annotated.
Page 3-31, Section 3.5.1, 1st paragraph on the page. Not all of the lower Yampa is on the 303d list. A recent rulemaking made some changes to the 303d list.	The agencies agree that the information as presented may be unclear and will update it.	**Page 3-31, Section 3.5.1, 1st paragraph on the page.** • Section has been rewritten to more clearly state that only Wilson Creek is on the 303(d) list for iron and sulfate. • The reference for this information has been updated.

Comment	OSMRE/BLM Response	Changes to the EA
Page 3-34, Section 3.5.2, 7th paragraph and Table 3.5-3. Figure 3-5 and Section 3.5.2. This figure and data provided for the groundwater monitoring locations does not present an accurate representation of the approved surface monitoring program (PR-03) for Collom. As presented it makes the reader believe that Colowyo has an extensive groundwater monitoring then the EA narrative only lists a few monitor sites. Currently, Colowyo is required to monitor MC-04-01, MC-04-02, MLC-04-01, MF-95-01, and MJ-95-03. Figure 3-5 also indicates that Colowyo is monitoring MS-04-01 and MS-04-01. Figure 3-5 also indicates that Colowyo is monitoring MWC-04-01, MWC-04-05, MWC-04-13, MWC-04-29, MWC-05-33, MWC-04-33, and UL-95-01. All of these locations are outside of the approved groundwater monitoring and were utilized for baseline groundwater monitoring program for Collom. A note or revised text should be included that clearly defines this difference in monitoring, or the EA needs to be amended to include the approved surface water monitoring sites only.	The agencies agree that this information should be updated in this section and in Figure 3-5.	**Page 3-34, Section 3.5.2.** • Text has been edited to indicate that some of the sites discussed and shown in the figure are currently monitored, while some were only monitored during the baseline data collection program. • A footnote has been added to Table 3.5-3 • The legend on Figure 3-5 has been annotated with the appropriate information.
Page 3-35, Section 3.6, 1st paragraph. The Axial Basin CRMP doesn't really do much to accurately describe the vegetation communities in the project area. This may be a confusing piece of information that doesn't seem pertinent to the project area vegetation.	The agencies agree that this information may be unnecessary.	**Page 3-35, Section 3.6, 1st paragraph** • The sentence discussing the Axial Basin CRMP has been removed.

Comment	OSMRE/BLM Response	Changes to the EA
Page 3-37, Section 3.6.1, 2nd paragraph. The Morgan Creek Ranch did perform mechanical treatment back in the 1990's. The language here and in subsequent sections makes a strong inference that the 60 acres were within the project area, but Colowyo cannot verify that 60 acres were treated "within the Project Area".	The agencies agree that unless the information can be verified to have occurred in the project area, it should be updated accordingly.	**Page 3-37, Section 3.6.1, 2nd paragraph** • The sentence has been updated to indicate that it is unknown where the treatments took place.
Page 3-48, Section 3.9, 1st paragraph. The reference to the existing BO should be for PR03, as approved in 2013.	The agencies agree that there was an unintentional error in the text.	**Page 3-48, Section 3.9, 1st paragraph** • This has been updated to PR03 as approved in 2013.
Page 3-55, Section 3.9.2.5, Table 3.9-2. Table 3.9-2 of the DEA accurately displays sage grouse lekking activity at a selection of leks in the vicinity of the Project since 2009. Because this data shows a strong surge in activity at Leks SG4 and SG12 in the past two lekking seasons, it seems appropriate that some additional context is warranted in the discussion above.	The agencies agree that some additional information may be useful to this discussion.	**3-55, Section 3.9.2.5, Table 3.9-2.** • New information has been inserted below the table indicating that the recent increase in lek attendance may be a result of relatively mild winters.
Page 4-2, Section 4.1.1, Table 4.1-1. The summary of the air impacts should use the defined impact categories.	The agencies agree with this change.	**Page 4-2, Table 4.1-1.** The table was made consistent in its use of the defined impact categories.
Page 4-2, Section 4.1.1, Table 4.1-1. The range presented in Indirect coal combustion criteria emissions seems high (0.05 to 100%) is very broad. Is it correct?	The agencies agree that this range is not useful as described and should provide clarification.	**Page 4-2, Table 4.1-1.** • This section was updated by describing how the numbers were calculated.

Comment	OSMRE/BLM Response	Changes to the EA
Page 4-3, Section 4.1.1, Table 4.1-1. Under the indirect coal combustion mercury deposition impacts, the numbers presented seem that they should be closer. The difference is 2.6 million tons.	The agencies agree that that there was an unintentional error in Table 4.1-1.	**Page 4-3, Table 4.1-1.** • This section was updated by correcting the number under Alternative B to 4.3%.
Page 4-4, Section 4.1.1, Table 4.1-1. Under the Wetlands summary, should the impacts be major considering that Colowyo will be required to offset any loss under the 404 permitting process.	This impact determination will be assessed to determine if it is a major impact. Information on mitigation will also be included in the appropriate section.	**Page 4-4, Section 4.1.1, Table 4.1-1.** • The wetland impact determination has been revised to minor. Mitigation required through the Section 404 permitting process with the USACE (**EA Section 4.7.4**) would reduce the effect to a minor, short-term impact. •
Page 4-8, Section 4.3.1.1, 3rd paragraph. Colowyo currently does not own all the equipment necessary to operate at a 5.0 mtpy maximum mining rate. Additional equipment would have to be secured. Second, the dispersion modeling that was conducted for Alternative B was based on a 5.0 mtpy mine plan and not a 5.1 mtpy rate as indicated in the EA.	The modeling assumed a conservative approach using the maximum potential mining rate, regardless if all necessary equipment is on site currently. The agencies agree that the maximum production rate should be changed to 5.0 mtpy.	**Page 4-8, Section 4.3.1.1, 3rd paragraph.** • This statement has been updated, as well as throughout Chapter 4, to state that the maximum production rate for Alternative B is 5.0 mtpy.
Page 4-9, Section 4.3.1.2. The reference to PR03 should be changed to PR04.	The agencies agree that this change should be made as the use of PR03 was an unintentional error.	**Page 4-9, Section 4.3.1.2.** • Changed reference to PR04.

Comment	OSMRE/BLM Response	Changes to the EA
Page 4-10, Section 4.3.1.2. It seems irrelevant to present this information now that the West Pit is all mined out.	The agencies confirmed comment and agrees.	**Page 4-10, Section 4.3.1.2.** • This information was removed from the discussion.
Page 4-13. Section 4.3.2.2. 2nd paragraph on the page. The statement that because there are less than three exceedances per year, there is no violation may be misleading. It would be more appropriate to fully explain here that these are not violations and the data cannot be used for NAAQS compliance purposes because they are not regulatory monitors as noted above.	The agencies agree that this statement would benefit from additional explanation.	**Page 4-13, Section 4.3.2.2, 2nd paragraph.** • Additional information was added to clarify this statement.
Page 4-17, Section 4.3.2.2, 1st paragraph on the page. The last sentence in this paragraph should maybe say the impacts are insignificant for statewide and nationwide affects.	The agencies agree that this information should be added.	**Page 4-17, Section 4.3.2.2, 1st paragraph on the page.** • The information was added to the section.
Page 4-19, Section 4.3.2.3, 1st paragraph. The only paved road for the Collom expansion is the Jubb Creek haul road. All other out-of-pit haul roads will be watered and dust suppression chemicals will be applied if applicable.	The agencies agree that this change should be made.	**Page 4-19, Section 4.3.2.3. 1st paragraph.** • This sentence was updated to include information that only the Jubb creek road would be paved and all others would be watered and treated for dust suppression.
Page 4-19, Section 4.3.2.3, 2nd paragraph. Mechanical stabilization and seeding the out of pit hauls roads other than the Jubb Creek haul road is not operationally feasible. Haul roads in the pit and within the temporary spoil pile are constantly moving and it is not practical to attempt to seed them.	The agencies agree with this change and it will be updated.	**Page 4-19, Section 4.3.2.3, 2nd paragraph.** • The second to last sentence was revised to indicate that only the Jubb Creek haul road would be mechanically stabilized.

Comment	OSMRE/BLM Response	Changes to the EA
Page 4-24, Section 4.3.2.5, 4th paragraph. If this number is supposed to be a life of mine number, it should be set at 2031 to represent the life of the mine.	The agencies agree with this change. The year had previously included reclamation, which is not included in the life of mine.	**Page 4-24, Section 4.3.2.5, 4th paragraph.** • Changed 2017 to 2031.
Page 4-26, Section 4.3.2.5, 3rd paragraph. In addition to the valid reasons stated in this section for not using the federal Social Cost of Carbon ("SCC"), OSMRE should also, at a minimum, point out that the SCC was not designed for use in NEPA analyses. This was explained by the Interagency Work Group ("IWG") in its original Technical Support Document, and re-affirmed by the IWG in 2015 in response to questions in a state level resource planning proceeding. A copy of the relevant portions of those responses is attached.	The agencies agree with this change.	**Page 4-26, Section 4.3.2.5, 3rd paragraph.** • Additional information has been inserted here from the IWG.
Page 4-28, 3rd paragraph. Ozone chemistry is complicated and this text could be a little misleading. The Rangely site is heavily influenced by the Uintah Basin O&G activities but those activities have been controlled and the ambient concentrations are on the decline.	The agencies agree that the wording should be clarified for accuracy.	**Page 4-28, 3rd paragraph.** • This wording was rewritten for clarification and accuracy purposes.
Page 4-29, 4th paragraph. Additional language inserted.	The agencies agree with this change.	**Page 4-29, 4th paragraph.** • This section was updated to state that difference is due to actual measurements being taken after 2008 versus estimates before 2008.

Comment	OSMRE/BLM Response	Changes to the EA
Page 4-31, Section 4.3.2.6. What about SO_2?	The agencies confirmed that SO_2 should be included in this section.	**Page 4-31, Section 4.3.2.6.** • SO_2 was added.
Page 4-31, Section 4.3.26, 3rd paragraph in this section. Why don't the monitors meet the DQO's? The FEM monitors are set up and installed to help gage the high wind events and high values for PM that occur due to high wind events. The high wind conditions are a recognized issue in NW Colorado and operations at Colowyo are reasonably controlled.	The agencies agree that clarification is required for this statement.	**Page 4-32, Section 4.3.2.6, 4th paragraph.** • Additional information was added as to why the monitors do not meet the DQO's.
Page 4-32, Section 4.3.2.6, 1st paragraph. There are not any mining operations in the project area yet and won't be until the project is approved by OSMRE and BLM. Suggest changing within to adjacent.	The agencies agree with this change.	**Page 4-32, Section 4.3.2.6, 1st paragraph.** • "Within" has been changed to "adjacent to".
Page 4-33, Section 4.3.2.6, 2nd full paragraph. Why don't they meet the DQO's? The FEM monitors are set up and installed to help Colowyo and the APCD gage the high wind events and high values for PM that occur due to high wind events. The high wind conditions are a recognized issue in NW Colorado and operations at Colowyo are reasonably controlled.	The agencies agree that additional clarification is required in this section.	**Page 4-31, Section 4.3.2.6, 2nd full paragraph.** • Additional information on the requirements of FEM monitors has been added.

Comment	OSMRE/BLM Response	Changes to the EA
Page 4-34. Section 4.3.3. Throughout this section of the EA it indicates that a proposed mine plan of 5.1 mtpy was utilized for the emissions estimates. This is incorrect. The air dispersion model was for Alternative B was based on a 5.0 mtpy mine plan. Although, this is not a significant reduction when compared to the Alternative A mine plan of 5.1 mtpy, the EA needs to be updated to reflect this correct mine plan rate for Alternative B. It is requested that OSMRE update Section 4.3.3 based on a 5.0 mtpy mine plan and all corresponding analyses in the section.	The agencies agree that the section should be updated to a maximum production rate of 5.0 mtpy.	**Page 4-34, Section 4.3.3.** • Throughout this section, a maximum production rate of 5.0 mtpy has been used and any affect analysis has been updated.
Page 4-35, Section 4.3.3.2, 2nd paragraph. The reference in this paragraph should be Alternative B.	The agencies agree with this change.	**Page 4-35, Section 4.3.3.2, 2nd paragraph.** • The reference in this paragraph has been changed from Alternative A to Alternative B.
Section 4.3.3.4, Indirect Combustion Criteria Impacts. The Project will neither increase nor decrease combustion at the Craig or Hayden Generating Stations. This point is well made in the discussion about greenhouse gas emissions (GHGs), but should also be made clear in the criteria air pollutant emissions discussion. In addition to ranging into areas of impossibility, excessive conservatism, as identified in Summary Comment 6, also produces a wide range of estimates (e.g., under varying assumptions, Collom tract coal would contribute between 0.05 to 100% of regional indirect coal combustion criteria emissions) that are of little use to the public or agency decision makers.	The agencies agree that additional language is needed and will update this section.	**Page 4-44, Section 4.3.3.4, 4th paragraph.** • Additional language was added to Section 4.3.3.4 of the EA to clarify the meaning of the relative emissions ranges. The relative emissions percentages did vary widely by pollutant which caused the large spread.

Comment	OSMRE/BLM Response	Changes to the EA
Page 4-45. Section 4.3.3.4, Social Cost of Carbon. Additional language has been provided.	The agencies agree that additional language is needed and will update this section.	**Page 4-46, Section 4.3.3.4, 2nd and 3rd paragraphs.** • This section was revised to include with additional information.
Section 4.3.3.4, Social Cost of Carbon. The EA Section 4.3.2.5 addresses the SCC as a part of the analysis of indirect impacts from the combustion of the coal; however, in addition to the reasons stated in this section for not using the SCC protocol, the SCC protocol was not designed for use in NEPA analyses. This was explained by the Interagency Work Group (IWG) in its original Technical Support Document, and re-affirmed by the IWG in 2015 in response to questions in a state level resource planning proceeding.	The agencies agree that additional language is needed and will update this section.	**Page 4-46, Section 4.3.3.4, 2nd and 3rd paragraphs.** • Additional language was added to Sections 4.3.2.5 and 4.3.4.4 clarifying this point.
Page 4-57, Section 4.5.1.2, 4th and 5th paragraphs. Alluvium should be changed to colluvium.	The agencies agree with the changes.	**Page 4-57, Section 4.5.1.2, 4th and 5th paragraphs.** • Alluvium has been changed to colluvium in two places.
Page 4-63, Section 4.8.1, 1st bullet. The one-size fits all scenarios of no ground disturbing activities between December 15 and July 15 for any topsoil removal is a significant limitation on the operational activities at the mine. It would be more appropriate to define the when there. Suggest deletion of this sentence and making the second bullet part of the ongoing narrative.	After further review it appears that this measure was specific to the previous South Taylor project and is not applicable to the Collom project.	**Page 4-63, Section 4.8.1, 1st bullet.** • This bullet has been removed.

Comment	OSMRE/BLM Response	Changes to the EA
Page 4-65, Section 4.8.1.3, 2nd full paragraph. A proposed rewrite of the impacts to migratory birds has been provided to clarify the measures that will be in place under this alternative.	The agencies agree with the suggested rewrite.	**Page 4-65, Section 4.8.1.3, 2nd full paragraph.** • The section has been rewritten.
Page 4-83, Section 4.9.2.2, 1st paragraph. The distances of the lek to various disturbances should be updated.	The agencies agree with this change.	**Page 4-83, Section 4.9.2.2, 1st paragraph.** • The distances from lek SG4 to various components of Alternative B have been updated.
Page 4-86, Section 4.9.2.2, Figure 4-6. This figure is for Alternative B, but has the Alternative A disturbance area on it. Please update Figure 4-6 with the correct disturbance area for Alternative B.	The agencies agree with this change.	**Page 4-86, Figure 4-6.** • This figure was updated to include the correct disturbance area.
Page 4-88, Section 4.9.2.2, 2nd paragraph on page. CPW analysis indicated the mitigation lands total 4,540 acres.	The agencies agree with this correction.	**Page 4-88, Section 4.9.2.2, 2nd paragraph.** • The acreage was updated to 4,530.
Page 4-88, Section 4.9.2.2, 2nd paragraph on page. Requested re-write to the paragraph detailing how the proposed protections will benefit the sage grouse.	The agencies agree with some additional edits.	**Page 4-88, Section 4.9.2.2., 2nd paragraph.** • Section was updated to indicate that there would be an increase in protections to the sage grouse from this alternative.

Comment	OSMRE/BLM Response	Changes to the EA
Page 4-91, Section 4.9.3. Section 4.9.1.1 of the DEA discusses the impacts of contaminants arising from coal combustion on Colorado River Fish and the Yellow-Billed Cuckoo. The DEA should make clear that there is no evidence that net combustion at either Craig or Hayden generating stations will be affected if the No Action Alternative is selected, because OSMRE does not regulate either station and both stations have alternative sources of coal. Consequently, coal from the Collom operations cannot be the "but-for" cause of combustion impacts. This is well-stated at Section 5.3 of the DEA, but should also be stated in the context of effects on sensitive species and in references to consultation with the US Fish & Wildlife Service (See Appendix C).	The agencies agree that additional discussion is required.	**Page 4-91, Section 4.9.3.** • Additional language was added detailing that under the No Action Alternative, the generating station would continue to operate.
Page 4-96, Section 4.13.1.2. Provided a rewrite of this section as there is doubt that there would be an obvious and noticeable change to the visual resources.	The agencies agree in part with this comment as there would be some residual impacts to the visual resource.	**Page 4-96, Section 4.13.1.2.** • The suggested language has been revised to clarify that impacts would be noticeable only from close up.
Page 4-103, Section 4.19.1. Recommend removing second to last sentence. Similar comment to the one on Page 2-2 as described above.	The agencies agree with this change.	**Page 4-102, Section 4.19.1.** • The second to the last sentence has been removed.

Comment	OSMRE/BLM Response	Changes to the EA
Page 5-1, Section 5.2, 2nd paragraph. The acreage of disturbance associated with the current operation is incorrect. It should be 3,786 acres of disturbance as reported to DRMS in the 2014 annual reclamation report. The 3,786 total does not include the Phase III release areas as jurisdiction has been terminated on those areas. Even if they are added in the total it does not added up to the acreage that is presented here.	OSMRE has contacted CDRMS and verified the suggested acreage number as correct.	**Page 5-1, Section 5.2, 2nd paragraph.** • The new acreage number has been inserted.
Page 5-2, Section 5.2, 3rd full paragraph. In 2011, Colowyo, as the surface landowner, removed all the wheat fields surrounding the Gossard Loadout facility from production. Suggest this reference be deleted.	The agencies agree with this deletion.	**Page 5-2, Section 5.2. 3rd paragraph** • The sentence has been removed.
Page 5-4, Section 5.3, 3rd paragraph. OSMRE should also discuss the impacts of the Secretarial Order on the future of the lease mod application for Foidel Creek and the other mines that are discussed below.	The agencies agree with this comment and will insert the language.	**Page 5-4, Section 5.3, 3rd paragraph.** • A discussion on the Secrtarial Order has been inserted into this section as it pertains to future actions.
Page 5-6, Section 5.4.1. Colowyo reported to DRMS in the 2014 Annual Reclamation report, Colowyo currently has 1,583 acres of reclamation in varying states. If the 2015 reclamation acres are included this would add another 77 acres for a total of 1660 acres.	The agencies agree with the change in acreage.	**Page 5-6, Section 5.4.1.** • The new acreage number has been inserted into this discussion.

Comment	OSMRE/BLM Response	Changes to the EA
Page 5-19, Section 5.4.4. A new paragraph discussing a State of Colorado analysis of mining operation impacts on the Yampa River Basin has been provided.	The agencies agree to this change if it matches the CDRMS' information.	**Page 5-19, Section 5.4.4.** • As CDRMS concurs with this discussion, it has been added.
Page 5-20, Section 5.4.4, 4th full paragraph. Any BLM lands within the SMCRA permit boundary that are managed by Colowyo through grazing leases will be subject to a grazing management plan and that plan, when it is written, will determine the amount of grazing on the federal lands. Please delete this.	The agencies agree with this deletion.	**Page 5-20, Section 5.4.4, 4th paragraph** • The sentence regarding grazing after reclamation has been removed.
Page 5-22, Section 5.4.7, 3rd paragraph. Colowyo has (voluntarily) reduced the total acres in the Morgan Creek Ranching for Wildlife to 19,782 acres.	OSMRE has verified and the agencies agree with this change in acreage.	**Page 5-22, Section 5.4.7, 3rd paragraph.** • The acreage has been changed from 30,265 to 19,782 acres.
Page 5-26, Section 5.4.13, 1st paragraph. The CIAA is the SMCRA permit boundary here and in the next paragraph it is the project area with a 20 mile buffer. We think the description is correct in the second paragraph but either way it should be resolved to be the same boundary.	The agencies agree with this comment. The CIAA includes the 20 mile buffer.	**Page 5-26, Section 5.4.13, 1st paragraph.** • The first sentence has been updated to state the CIAA is the project area with an additional 20 mile buffer.
Page 5-29, Section 5.4.18. Operations in the East Pit were started in 1977 as noted earlier in the EA and would make this reference to 21 years incorrect. Mining operations and associated noise have been ongoing for about 38 years.	The agencies agree with this change.	**Page 5-28, Section 5.4.18.** • This new information has been inserted and the old number has been removed.